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Turner, Jonathan Winston

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An investigation of progression of King's College London undergraduates through their dental programme and students' perception of factors affecting their progression

Jonathan Winston Turner BDS, MSc, MA(Ed)

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King's College London Dental Institute
London SE1 9RT

Abstract

A number of students fail to progress through their university studies, with some re-sitting years or having their studentship terminated. In addition, some students may not reach their full potential despite progressing satisfactorily. The purpose of this research was to investigate performance of King's College London Dental Students in end-of-year examinations, as they progressed through their programme and to identify factors which may affect progression. A mixed-methods research design was employed including a longitudinal data analysis, questionnaires, focus groups and one-to-one interviews.

BDS1 students perceived differences in volume of university work, compared to school, caused difficulties. Approximately, 66% of BDS5 students progressed without resitting an end-of-year examination and those that did most commonly cited family problems as a contributory cause. In a regression model using gender, perceived stress scores, accommodation factors and debt worries as explanatory variables, none were predictors of examination performance.

There were fluctuations in performance, with at least 70% of students not remaining within the same top, middle or bottom third of their year group, as they progressed. There was a weak to moderate correlation ($r = 0.33$ to 0.55, $p < 0.05$) between performance at beginning and end of the programmes though more than 70% of the variance was not accounted for. The unaccounted variance may be accounted for by findings in the qualitative

strand of this research in which the six interview themes emerged: study/supporting study, the dental programme, personal life, feelings, students' behaviour/ differences/ interactions, and assessment. The importance of support to successful progression was a recurring topic.

In conclusion the performance of most students, relative to their peers, fluctuated as they progressed through their programme. Inter-personal interactions appeared to have a major influence on progression and may explain much of the variation in performance at beginning and end of the programme.

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Glossary of abbreviations

ADEE:	Association for Dental Education in Europe
ANOVA:	Analysis of Variance
AR:	Abstract Reasoning
BCS:	British Cohort Study
BDA:	British Dental Association
BDS:	Bachelor of Dental Surgery
BDS1:	Year 1 of the 5-year BDS programme
BDS2:	Year 2 of the 5-year BDS programme. First year of the GPEP pathway
BDS5:	Final year of the BDS programme
BEME:	Best Evidence Medical Education
BMAT:	BioMedical Admissions Test
C1:	Cohort 1 (5-year students starting 2007)
C2:	Cohort 2 (5-year students starting 2008)
C3:	Cohort 3 (GPEP students starting 2008)
C4:	Cohort 4 (GPEP students starting 2009)
C5:	Cohort 5 (5-year students starting 2012)
C6:	Cohort 6 (5-year students starting 2013)
C7:	Cohort 7 (5-year students starting 2009)
C8:	Cohort 8 (GPEP students starting 2010)
CRE:	Clinical Reasoning Examination
DA:	Decision Analysis
DAT:	Dental Admissions Test
DES:	Dental Environment Stress Questionnaire

DF(T)1:	Dental Foundation (Training) Year 1
DPMG:	Dentistry Entry Pathway for Medical Graduates
EMQ:	Extended Matching Question
GAMSAT:	Graduate Australian Medical School Admissions Test
GPEP:	Graduate/Professional Entry Pathway
HE:	Higher Education
HEFCE:	Higher Education Funding Council for England
ICA:	In-Course Assessment
IM:	Instant Messaging
KCL:	King's College London
KCLDI:	King's College London Dental Institute
LSQ:	Learning Style Questionnaire
LSYPE:	Longitudinal Study of Young People in England
MBI-SS:	Maslach Burnout Inventory – Student Survey
MBTI:	Myers-Briggs Type Indicator
MCAT:	Medical College Admissions Test
MCQ:	Multiple Choice Question
NSS:	National Student Survey
OSCE:	Objective Structured Clinical Examination
PRT:	Peer Review of Teaching
PSS:	Perceived Stress Scale
PSS10:	10-item PSS
PSS14:	14-item PSS
Q1:	Questionnaire 1 (Distributed 2013)
Q2:	Questionnaire 2 (Distributed 2014)

QR:	Quantitative Reasoning
SBR:	Single Best Response
SD:	Standard Deviation
SJ(T):	Situational Judgement (Test)
SPSS	Statistical Package for the Social Sciences
UCAS:	The University and Colleges Admissions Service in the UK
UHR:	University Halls of Residence
UKCAT:	United Kingdom Clinical Aptitude Test
VR:	Verbal Reasoning

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Introduction

King's College London Dental Institute (KCLDI) is the largest dental school in the UK, with over 160 students graduating each year (KCL, 2017).

There are four undergraduate dental pathways currently offered by KCLDI; the five-year programme, A205, the five-year enhanced support programme, A206, the four-year graduate/professional entry pathway (GPEP), A202, and the three-year pathway for medical graduates (DPMG), A204.

The majority of students, entering the dental programme, graduate successfully upon completion of their studies, however a number fail to progress with their peers for a variety of reasons. In 2012, 22 (18%) of the 120 Year 1 (BDS1) students failed the first sitting of their end-of-year examination with 8 (7%) then failing their resit and having their studentship terminated (Table 1).

Table 1. The number of BDS1 and BDS2 students failing the first sitting and the resit of the end-of-year BDS examinations in 2012 and 2013.

	2012 N (% of year)	2013 N (% of year)
BDS1 students failing first sitting	22 (18%)	22 (17%)
BDS1 students failing resit	8 (7%)	5 (4%)
BDS2 students failing first sitting	33 (22%)	14 (9%)
BDS2 students failing resit	8 (5%)	2 (1%)

Similarly in 2012, 33 (22%) of the 153 students in Year 2 (BDS2) failed their end-of-year examinations with 8 (5%) then failing their resit (personal communication, Examinations Office 2013). Similar figures were published

for 2013 (Table 1). A significant number of students, who have their studentship terminated, successfully appeal and return to repeat the year. Five BDS1 students failed the 2013 resit examination (Table 1), three of whom successfully appealed.

Resources, such as occupational health and student support, are available to identify and manage serious issues affecting KCLDI students, such as health problems resulting in absences from university. Students may, however, progress to complete their degree without having missed any sessions, failed any exams, or sought any form of pastoral care. This does not necessarily indicate that their progression has been uneventful nor that they have realised their full potential; they have simply “got through” and “gone under the radar” of KCLDI. Facilitating changes which allow students to reach their full potential, would conceivably also increase motivation, morale and satisfaction.

Working in general dental practice is recognised as stressful (Chapman et al., 2015), with time-pressures and management of uncooperative patients being commonly reported stressors (Myers & Myers, 2004). On graduation, the majority of students move into Dental Foundation Training posts and then general practice. Identifying and hopefully resolving any issues that have developed at Dental School, may help reduce stress levels in general practice later on.

In addition to the consideration of student welfare, student well-being and satisfaction is also monitored through the National Student Survey (NSS) and the results can be used by prospective students to select a University to attend (HEFCE, 2015a). Performing well in the NSS is considered by KCLDI to be of strategic importance.

Hardman et al. (2013) argue: "...a university's business is very much about students progressing through their academic careers; therefore, it is of the most crucial importance to ascertain the factors affecting this progression and whether the available data can give insights into factors that can assist successful student progression". The relevance and importance of undertaking research investigating student progression, is thus apparent.

1 Chapter 1. Literature review

1.1 Factors known about students upon entering university

School academic achievement, age at entry, ethnicity and examinations, such as the United Kingdom Clinical Aptitude Test (UKCAT) have been used to predict future performance and progression, with retrospective and prospective studies and systematic reviews of the literature.

1.1.1 School academic achievement

A systematic literature review of 83 health-profession related articles, reported “overwhelmingly clear” evidence that school academic grades predicted university academic performance (Salvatori, 2001). These data were supported by another systematic review, from medical school admissions with a total sample size of 21,905 students, that reported previous academic performance to be a good predictor of undergraduate performance, accounting for 23% of the variance in performance (Ferguson et al., 2002). The outcomes considered were of a general nature, achieved by combining both preclinical and clinical assessments.

A critical review, on admissions to North American dental schools, reported that grade point averages achieved during students’ previous undergraduate degree were predictive of academic performance at dental schools (Ranney et al., 2005). However, these authors cited two potential limitations on high correlations between predictors and outcomes; less variance in exam success existed between successful applicants to dental school, compared to the whole applicant pool and the reliability of the academic outcome

measures was often unclear. A retrospective cohort study, involving 176 American dental students over a 10-year period, observed that students who graduated in the top 10% of their year-group (based on academic assessments) had statistically higher grade point averages, on entry, than those graduating in the bottom 10% of their year-group, or those who had repeated a year or had left the school (Ballard et al., 2015). A potential weakness of this work was that it involved comparisons in data collected over a 10-year period, and relatively small sample sizes – only 25 repeating students over this time-period for example.

A United Kingdom prospective cohort study, using follow-up questionnaires sent 20 years after entry to medical school, demonstrated A-levels to be predictive of both performance in medical school finals examinations and time taken to achieve membership qualifications post-qualification (McManus et al., 2003). Similarly, a more recent study utilising meta-regression of six UK longitudinal studies (medical school entry, 1972 to 2009) observed secondary school academic achievement to be strongly predictive of both undergraduate and postgraduate performance, with undergraduate performance including both pre-clinical and clinical assessments (McManus et al., 2013a). The strongest correlation was observed between A-levels and the first-year basic medical science (BMS) examination, with 65% of the variance in the BMS exam accounted for by A-level performance. The authors note that the 35%, not accounted for by A-levels, may be accounted for by other factors, including personality, motivation or problems related to finance, peers, relationships or family, stating “...a major challenge has to be

identifying the causes or the correlates of that additional variance...". A difference was also observed between written and clinical examinations, with the correlations between A-level grades and MRCP(UK) written exams stronger than those with MRCP(UK) clinical exams. In a cross-sectional prospective study, involving 4,811 students at 12 UK medical schools, McManus et al. (2013b) observed that even small decreases in A-level examination scores equated to decreased performance in year-one (academic) examinations. Interestingly, the study observed that no particular A-level subject was predictive of the outcome (McManus et al., 2013b). The strength of this work was the large sample size, use of multiple sites and so increased generalizability. The outcome measures were of a non-clinical nature and despite considering theory and skills assessments separately, the definitions of the terms "theory" and "skills" were left to individual medical schools.

The correlation between previous academic achievement and future clinical performance, appears less clear than that with future academic achievement (Salvatori, 2001). A retrospective cohort study reported that A-level results were significant predictors of UK medical students' performance at a Year 3 OSCE (Lumb & Vail, 2004) but it could be argued that being predictive of one specific part of an examination is of questionable relevance. By contrast, Park et al. (2006) found no such associations, in their retrospective cohort study, between American dental students' school grade point average and their subsequent clinical performance.

1.1.2 Screening tests for medical and dental admissions

Different admissions screening tests, used around the world, appear to have varying degrees of success at predicting future performance. These tests include The Medical College Admission Test (MCAT), used in the USA and Canada (Medic Portal, 2017), the Dental Admission Test (DAT), used in the USA and Canada (ADA, 2017), the BioMedical Admissions Test (BMAT), used in the UK, Australia, Thailand and Singapore (BMAT, 2017), the Graduate Australian Medical School Admissions Test (GAMSAT) used in Australia, Ireland and the UK (GAMSAT, 2017a) and the UKCAT, used in the UK (UKCAT, 2017a). These tests vary in the nature of their assessment and therefore caution is needed when comparing research, as like-for-like comparisons are not possible. Similarly, the intake of many overseas medical and dental schools are comprised entirely of graduates, who will be older than many UK intakes, who enter straight from secondary school.

The United Kingdom Clinical Aptitude Test (UKCAT) is an online test of cognitive and non-cognitive skills, the results of which are used by 25 UK medical schools and 14 dental schools, including KCLDI, as part of their student selection process for 2018 entry (UKCAT, 2017a). The GAMSAT was used by Plymouth University for applicants to Dentistry not entering directly from school (Plymouth University, 2016 p.70) and by seven UK medical schools (GAMSAT, 2017b) in 2017. The BMAT was used by University of Leeds School of Dentistry and eight UK medical schools for entry in 2018 (BMAT, 2017).

The 2016 UKCAT comprised 5 sections: Verbal Reasoning (VR), Quantitative Reasoning (QR), Abstract Reasoning (AR), Decision Making (DM) and Situational Judgement (SJ), each being marked separately, with universities given the individual scores, except for DM (UKCAT 2017b). The DM subtest, was piloted in 2016 and replaced a Decision Analysis (DA) test (UKCAT 2017c). UKCAT has been used as an aid to the dental admissions process at KCLDI since the 2007 entry diet.

During 2013, 25,679 candidates sat the UKCAT examination, with males scoring more highly than females at the VR, QR and AR sections and comparably at the DA sections (UKCAT, 2014 p.12). Females scored more highly than males at the SJ. Differences were also observed between ethnic groups, white candidates obtained the highest mean score in the SJ and VR sections and Chinese candidates in the QR, AR and DA sections (UKCAT, 2014 p.13). Black candidates performed least well in the cognitive sections, compared to other UK ethnic groups. Although large sample size added value to the report, the relatively small size of some of the ethnic groups made comparisons more difficult. This difference between gender and ethnic groups may have relevance to progression during the dental programme.

The prospective analysis of data from 12 UK medical schools, described in Section 1.1.1 above, observed UKCAT to be a predictor of first-year academic examination outcomes, particularly for females and mature students, and had small but significant incremental validity (McManus et al., 2013b). Tiffin et al. (2016) similarly observed UKCAT to have incremental

predictive validity throughout medical undergraduate training. UKCAT was reported to be a better predictor of written examination and OSCE performance in the later years of medical training than the earlier years (Husbands et al, 2014) with Adam et al. (2015) reporting UKCAT was related to final-year medical school performance in both written and clinical examinations and Sartania et al. (2014) similarly observing UKCAT to predict students' rankings in medical finals examinations.

Little work has been undertaken on the predictive value of the UKCAT in dental schools. A small positive correlation ($r = 0.08$, $p = 0.02$) between UKCAT scores and summative assessments for graduate-entry dental students was observed at Aberdeen Dental School (Foley and Hijazi, 2015). The sample size was small however and the assessment data comprised a combined academic score from all years of study, making differentiation between clinical and non-clinical years impossible.

1.1.3 Age at entry / graduate entry

The effect of students' age or possession of a prior degree on performance, have produced conflicting results. Mature UK medical students were reported to have performed "exceptionally well" in a Year 3 objective structured clinical examination (OSCE), despite having relatively lower A-level grades compared to younger students (Lumb & Vail, 2004). It is difficult to determine the validity of this observation however, without detailed knowledge of what was actually being assessed. By contrast, Woolf et al. (2013) reported that older UK medical students were more likely to fail their final examinations

and similarly Adam et al. (2015) reported younger medical students generally performed better than older students, in a range of academic and clinical and professional outcomes.

Graduate students were reported to be more co-operative, than school-leavers (Wilkinson et al., 2004), though the degree subject was not specified. During structured one-to-one interviews, final-year graduate-entry UK dental students specified that study techniques, and also research and team-working abilities, were skills they had acquired during their previous degree (Newton et al., 2011). They explained that commitments, including part-time work and family life, added to the challenge of studying dentistry.

1.1.4 Gender

Female medical students have been reported to out-perform males in both academic assessments (Yates & James, 2007, Ferguson et al., 2002, McManus et al., 2013b and Adam et al., 2015) and clinical assessments (Ferguson et al., 2002 and Adam et al., 2015), however, the relationship between gender and performance for dental students is less clear, with conflicting results reported in the literature. A hierarchical regression analysis of Sri-Lankan dental students, reported females out-performed males during their first-year academic assessments (Ariyasinghe & Pallegama, 2013) and Kim & Lee (2007) reported female, graduate-entry Korean dental students performed better than males in first-year academic examinations. A similar finding was reported by Mercer et al. (2013), who analysed 12 cohorts of Australian dental students (1999 to 2011 entry) using logistic regression.

Females were reported to perform better academically than males, in each of the first four years of study, and also out-performed males in some clinical assessments.

By contrast, American Part II National Board Dental Examination scores were assessed using an analysis of covariance, and a small gender difference was observed, with males reported to perform significantly better than females (Fields et al., 2003). The exact format and proportion of academic or clinical assessment involved was unclear. The authors suggested possible explanations for this gender difference, including the possibility that females may adopt a more thorough, and time-consuming, approach to problem-solving than males, tend to undervalue their knowledge and are averse to risk-taking so avoid guessing answers. Such an approach would work against them in timed multiple-choice style examinations. Similarly, it is feasible that academic grade differences, observed between gender, may be accounted for by issues such as self-confidence and test anxiety as opposed to academic ability (Furnham & Chamorro-Premuzic, 2005) or low self-esteem (Stewart et al., 2006, citing Bandura, 1977). The gender differences observed in UKCAT performance, discussed in Section 1.1.2, may be a result of similar factors.

A retrospective analysis of 416 American dental students graduating between 1996 and 2003 reported no statistical difference in performance between gender in the state licensure examinations (Stewart et al., 2006) and Sanders & Lushington (2002) similarly reported gender did not predict

Australian dental students' academic performance. Gender of UK graduate-entry dental students was not predictive of end-of-year written and practical examination scores, in a study involving 71 individuals (Foley & Hijazi, 2015). The Stewart et al. (2006) and Foley & Hijazi (2015) studies did not consider student ethnicity however, which was potentially a confounding variable.

1.1.5 Ethnicity

Contrary to the work of Sanders & Lushington (2002) most researchers have noted a relationship between ethnicity and academic performance. The classification "ethnicity", as used by Sanders & Lushington (2002) was comprised solely of Australian students or International students and so was a blunt measure, limiting validity. Language barriers and the need for cultural adjustment were additional factors potentially influencing International students' academic performance, rather than ethnicity per se (Sanders & Lushington, 2002). Yates & James (2007) observed non-white ethnicity to be the most significant predictor of poor performance during medical students' clinical years at Nottingham University, both for "home" students and overseas students. Similarly, Lumb & Vail (2004) observed ethnic minority students at a UK medical school performed less well during a Year 3 OSCE.

A systematic review and meta-analysis of 23 reports, relating to the academic performance of 24,000 medical students and doctors, observed non-white candidates underperformed at both undergraduate and postgraduate assessments (Woolf et al., 2011). White students were similarly observed by McManus et al. (2013b) to perform more strongly

during year one (academic) medical school examinations, and by Woolf et al. (2013) to perform significantly better than ethnic minority students in both final written and OSCE examinations. Variables including prior academic attainment, conscientiousness and father's socio-economic status were not significantly associated with performance differences between ethnic groups, though these variables by themselves did significantly predict how students performed (Woolf et al., 2013).

1.1.6 Successful applicants

The Government is developing initiatives aimed at widening participation in higher education (HE), having particular concern for white British males from disadvantaged backgrounds, who are five times less likely to participate in higher education than white males from advantaged backgrounds (BIS, 2015a). Similarly, considerable differences exist in HE participation between ethnic groups, with Chinese pupils in the bottom socio-economic quintile, 10% more likely to participate in higher education than white British pupils in the top socio-economic quintile (BIS, 2015b).

In 2015, there were 1,095 successful applicants to pre-clinical dentistry in the UK, (UCAS, 2016a) of which 410 (37%) were male and 685 (63%) female. (UCAS, 2016b) The majority were domiciled in the UK (1,005) though five were domiciled elsewhere in the EU and 85 in non-EU countries (UCAS, 2016c). The two largest ethnic groups within the successful applicants were white and Asian, comprising 500 and 380 students respectively (UCAS, 2016d).

In a retrospective analysis of data from the Universities and Colleges Admissions Service in the UK (UCAS), Gallagher et al. (2009), reported that successful applicants to dentistry, in 2006, were more likely to be from higher socio-economic backgrounds and an ethnic minority group compared to other applicants to higher education. Some of the factors found to reduce the likelihood of being accepted to dental school were mature applicant, male, lower social class, or belonging to an ethnic minority group.

A retrospective descriptive analysis of UCAS data, comparing four and five-year programmes commencing in the UK during 2007 and 2008, observed 84% of successful applicants entered the five-year programme and 14% the four-year (Niven et al., 2013). The proportion of females was similar in the two programmes and likewise of ethnic minority students, though the age-profile differed, with 9% on the 5-year programme being 'mature' (aged over-21), compared to 100% on the four-year programme.

1.1.7 Gap-year

The exact definition of the term "gap-year" varies, but is commonly used to describe taking time out from formal studies, prior to starting university (Birch & Miller, 2007) and is usually spent undertaking paid employment, voluntary work or travel (Heath, 2007). Proponents of the gap-year, claim those taking them have greater maturity than those who do not, are less distracted by university life and are less likely to drop-out, though there is a lack of academic research in this area (Heath, 2007).

Data from two large surveys, the Longitudinal Study of Young People in England (LSYPE) and the British Cohort Study (BCS), were used to analyse the characteristics and outcomes of UK gap-year takers (Crawford & Cribb, 2012). No difference in prior academic attainment was observed between gap-year takers and non-takers, in the case of the LSYPE data, however, the BCS analysis observed gap-year takers to have lower prior attainment. Over 80% of individuals undertook work during their gap-year, though gaining independence and having a break from education were the most common reasons for taking the year-out, rather than earning money for university (Crawford & Cribb, 2012). This observation was supported by King (2011), who undertook unstructured interviews, with 23 English university students, and reported gap-year applicants had increased confidence, maturity and independence.

Those BCS participants taking a gap-year were observed to be more likely to obtain a first or second-class degree, compared to those entering straight from school, though the authors noted that the quality of degree varied between universities, reducing the validity of this observation (Crawford & Cribb, 2012). Similarly, Birch & Miller (2007) analysed the academic performance of 6896 Australian undergraduates, and observed gap-year takers performed better in first-year exams, particularly male students who were low-performing at school.

1.1.8 Summary of Section 1.1

A large body of research has been reported on student entry characteristics and how these might influence future progression and performance. The findings are often conflicting and care is needed in their generalization to the UK dental school context. Evaluation of the validity of the literature proved problematic, in many cases, due to a lack of explanation as to the exact nature of the assessments used to determine performance, including question formats and reliability of marking processes. Few studies described a model of student progression, with the majority focussing on a small number of specific outcomes, most commonly academic performance in examinations at the end of year-one or at finals.

The literature was generally supportive that school academic performance was predictive of university academic performance, but not necessarily of clinical performance. Similarly, online admissions tests, such as UKCAT, were generally predictive of academic performance, with several recent studies also observing them to be predictive of performance at final medical examinations. The literature contained conflicting results with regards to the effect of medical and dental students' age and gender upon performance, though the body of evidence suggested females generally out-performed males, in both academic and clinical assessments. White ethnicity was also generally associated with stronger performance compared to non-white. Finally, a body of evidence suggested that students who undertook a gap year, prior to starting university, performed better than those entering straight from school.

1.2 Additional factors affecting progression during university

Students' progression during the course may be affected by financial concerns (Ross et al., 2006), stress (Silverstein & Kritz-Silverstein, 2010), accommodation (Essandoh et al., 2011) and support (Yorke, 2000). A report commissioned by the Higher Education Funding Council for England (HEFCE) investigating the causes of differences in student achievement during higher education (HE), reported that reviewing the evidence was complicated, due to the impact of factors external to HE (HEFCE, 2015b p.ii). The report described "macro level" factors associated with achievement, such as gender, social background, race and ethnicity, "meso level" factors associated with the individual educational establishments, and "micro level" factors, including day-to-day interactions between staff and students. The report detailed four "explanatory factors": curricula and learning, staff-student relationships, (particularly a sense of "belonging"), social, cultural and economic capital (including networking, external support and financial status) and psychosocial and identity factors (such as the support given by staff members).

In an additional HEFCE report, the characteristics of students graduating from English HE in 2013-14, who acquired a first class or upper second degree, were examined (HEFCE, 2015c). The findings included the observation that females had a greater likelihood of being awarded a first or upper second, white graduates performed better than those from other ethnicities and graduates with disabilities performed less well than those without.

1.2.1 The early stages of university - transition from school to university environment

The transition from the school-learning environment to a university setting, involves significant challenges for some and the potential to affect progression. The transition may include changes in the academic environment, accommodation and friendships (Pittman & Richmond, 2008), and affect attitudes and values (Hussey & Smith, 2010). Transitions are complex processes, due to changes to self-identity, with knowledge of individuals' social and cultural worlds needed in order to understand them (Crafter and Maunder, 2012) as students have different cultural and social capital upon entering university, which determines how well they deal with transition (Morosanu et al., 2010).

The recent expansion of university places resulted in students from a greater range of backgrounds, thus increasing the challenges faced by universities attempting to support student transition (Hussey & Smith, 2010). These observations reinforced a statement made by Crafter and Maunder (2012 p.17) that a "one size fits all" approach may be inappropriate, when considering how best to support individual students. Three implications to educators were described by Crafter and Maunder (2012); consideration of social aspects (by creating mentoring schemes), consideration of prior experience (necessitating personalised support requirements) and understanding the importance of the students' transition "journey" not just the final outcome. The concept of this "journey" was supported by McMillan (2013) who suggested that a "roadmap" is required to guide individuals

through the transition. Three focus group interviews, with 28 first-year South African dental and oral hygiene students, established that emotions were important in the transition to university and that not all students felt comfortable approaching teachers. A potential concern with the sample however, was that it included six individuals who had not entered the programme directly from school.

A similar finding was reported by Krause (2001), who used a written survey and group interviews with Australian first-year psychology students. The students found their university a competitive and daunting place, and a small number felt nervous approaching teachers.

Interviews conducted by Christie et al. (2008) with 28 first-year humanities and social sciences students, explored the transition to university from further education colleges. The interviewees explained the process was an emotional one, leading to feelings of loss, alienation and exclusion, with the first term considered “a total write off”. Self-efficacy and optimism have been suggested by Chemers et al. (2001) as being important factors in helping students manage their transition to university, with their longitudinal study of American first-year students observing an association between self-efficacy and optimism and academic performance and adjustment to university life.

The most appropriate way to support students during this transition period has yet to be established, as these individuals may not be fully aware of their needs, and hence do not necessarily engage with any support (Hughes &

Smail, 2015). A qualitative survey of students' views, at the University of Derby, concluded that educational establishments should concentrate support in areas such as social integration, positive thinking and lifestyle choices, with administrative processes also identified as a potential cause of transition problems.

The nature of students' relationships with their parents was reported to be related to their ability to adjust to university life (Wintre & Yaffe, 2000). An indirect, positive relationship was reported between adjustment and an authoritative style of parenting, with current parental relationships also observed to be important, for example discussions between students and parents about university issues. The work comprised 408 Canadian psychology students, 75.6% of whom lived at home, thus limiting generalizability to universities where the majority of students do not live with parents. The finding does have potential relevance to KCLDI students, as a significant proportion do live with their parents at various points during their studies.

The nature of the students' accommodation, as well as factors such as gender and personality, may be relevant during this transition period. In a study of 511 American first-year students, males were reported to have adjusted better than females to living in university halls (Enochs & Roland, 2006). They explained that genders differ in the pressures placed on them by parents and in their ability to cope with stress and depression, which may play a role in the ability to adapt to their new environment. A survey of

Canadian students, living in suite-style or dormitory-style university halls, observed extroverted first-year students with low levels of conscientiousness had a greater sense of belonging than those introverted, conscientious students (Rodger & Johnson, 2005). Students living in suite-style buildings, (with self-contained apartments) also had a greater sense of belonging than those in dormitory-style halls, with shared bedrooms. But the study had a response rate of just 28.8% and a significant difference in response rate between the different accommodation types and so reduced its validity and reliability. Students living in residence have been observed to make over twice as many new friends, during their first year at university, than those commuting from home (Buote et al., 2007). In a mixed-methods study of Canadian students, Buote et al. (2007), established that the stronger these friendships were, the better students adjusted to university life, with a stronger correlation found for those living in residence compared to those commuting. An interview-based study of 34 first-year University of Brighton students similarly observed the strongest friendships were made between individuals that lived together (Wilcox et al., 2005).

The literature surrounding university transition tends to focus predominantly on the first year of study (Maunder et al., 2013) however transitions occur during other years also, for example the transition from novice to being skilled in an area (Hussey & Smith, 2010).

1.2.2 Belongingness

A student's feeling of belonging is closely associated with his/her successful transition from school to university and as noted earlier, belongingness has been associated with differences in student achievement at university (HEFCE, 2015b). A student's sense of belonging to their University has been defined as "the psychological sense that one is a valued member of the college community" (Hausmann et al., 2007). In the context of dental education, belongingness has been defined as being: "a deeply personal and contextually mediated experience in which a student becomes an essential and respected part of the dental educational environment where all are accepted and equally valued by each other and which allows each individual student to develop autonomy, self-reflection and self-actualisation as a clinician" (Radford & Hellyer, 2016).

Students' interactions on both a social and academic level help give a sense of belonging (Glass & Westmont, 2014) with increased stress and emotional problems liable to occur in those who feel they do not belong (Pittman & Richmond, 2008). A longitudinal survey of first-year students at an American university reported that peer-group interaction, faculty interaction, peer support and parental support were associated with a sense of belonging, at the start of the academic year (Hausmann et al., 2007). They observed a sense of belonging predicted students' intentions to persist and noted a decline in sense of belonging as the academic year progressed. The rate of decline was influenced by levels of academic integration and parental support; high levels of academic integration resulted in a greater sense of

belonging, though interestingly high levels of parental support were associated with a decline in sense of belonging (Hausmann et al., 2007). The work of Glass & Westmont (2014), involving eight American universities, established that a sense of belongingness was related to academic success for both home and International students, though more so in the latter group, possibly due to the lower levels of social support they have compared to home students. Interestingly, this sense of belongingness was greater for first-year than senior students.

A link with academic performance was similarly established by Kennedy & Tuckman (2013). The relationship between procrastination, belongingness and academic performance of 671 first-year American university students was explored, using structural equation modelling. Students that tended to procrastinate had lower levels of perceived belongingness, higher levels of perceived stress and performed less well academically. They explained that their findings support the provision of time-management training to students, during their first term and Pittman & Richmond (2008) similarly suggested universities develop means of increasing belongingness, such as helping students to form friendships.

A strong sense of belonging among a group of final-year dental students, at a UK outreach centre, was reported by Radford & Hellyer (2015) in a questionnaire based study. The authors attributed this, in part, to the relatively small size of the centre and the efforts of staff to show an interest in the students' social lives. Freeman et al. (2007) similarly observed that

teachers perceived as being encouraging, enthusiastic, friendly, helpful, organized and well prepared engendered a greater sense of belonging amongst their students. Likewise, it has been suggested that disengaged students may be helped, if staff forged closer relationships with them and paid an interest in their day-to-day lives (Morosanu et al., 2010).

1.2.3 Living and social

The nature of students' living arrangements can influence their transition to university. Accommodation and social factors may affect progression throughout their programme, with the quality and quantity of sleep that students experience in their accommodation, and use of social media, for example, both having the potential to affect performance.

1.2.3.1 Accommodation

A mixed-methods study, involving a questionnaire, interviews and focus groups, was conducted at four UK higher education institutions, to examine the choices and experiences of undergraduates who lived in their parental home (Holdsworth, 2006). Living at home impacted greatly upon non-academic life, with students enjoying their social life less and having a reduced ability to make friends, if their journey from home to university took over 30 minutes.

Noise within student accommodation has been reported to be a potential problem. A study to determine ambient noise levels, in four Ghanaian university halls of residence, observed two to be non-compliant with national

environmental regulations (Essandoh et al., 2011). Questionnaires completed by 150 residents observed arguments and music to be the two main sources of noise, with 67% irritated by it, due to study and sleep disturbance (Essandoh et al., 2011). Similarly, in a study involving semi-structured interviews and focus groups with 53 students and staff at a British University, International students complained about loud music late at night in their halls of residence (Andersson et al., 2012). The study also revealed other tensions within the halls of residence, such as an alcohol-drinking culture, which resulted in the self-segregation of some students.

1.2.3.2 Sleep

Sleep disruption may lead to mental disorders, due to a disruption to the memory reorganisation process (Landmann et al., 2014). A cross-sectional questionnaire based study, involving 410 Saudi Arabian medical students, observed low-performing students, in academic assessments, had later bed-times than high performing peers (BaHammam et al., 2012). Abdulghani et al. (2012) observed a significant relationship between daytime sleepiness and academic performance, in their self-administered, questionnaire-based study of first, second and third-year medical students. Female students were also observed to have more sleep disorder than males (Abdulghani et al., 2012). An association has been observed between medical students' sleep quality and stress, immediately before a pre-clinical examination, and subsequent performance in the examination (Ahrberg et al., 2012). The authors found no association, between performance and general term-time sleep quality and stress; the work comprised a self-completed survey,

involving 144 participants and a response rate of just 23%, and so it is possible that bias was introduced.

A self-administered questionnaire study was undertaken by Valic et al. (2014) to determine any relationships between sleep habits and academic performance of 447 high and low performing Croatian dental students. High-performing individuals went to bed earlier and woke earlier than the low-performing students, though the total time spent asleep did not vary between the two groups.

1.2.3.3 Social media

Students use a range of methods to maintain social ties with friends and family, and in particular instant messaging (IM) and social media (Mesch et al., 2012). In a mixed-methods study, involving a survey of 268 Canadian undergraduates, Quan-Haase (2007) observed that 67% used IM daily and 29% on a weekly basis, with 28% reporting over 3 hours use every day. Similarly, 92%, of the 1839 respondents to a survey of American undergraduates, used Facebook, with a mean of 106 minutes spent on the site by each student every day (Junco, 2012). IM enables students to exchange academic work in real time with peers, but also acts as a distraction from studies (Quan-Haase, 2008) with a relationship between increased use of social networking sites shown to decrease academic performance (Karpinski et al., 2013 and Junco, 2012) and the use of IM at the same time as studying shown to reduce efficiency (Fox et al., 2009).

1.2.4 Personality

The Five-Factor Model of personality describes the basic personality traits: neuroticism, extraversion, openness to experience, agreeableness and conscientiousness (McCrae and Costa, 1997). A meta-analysis of the literature of the personality dimensions and their possible relationship with academic performance, was conducted by O'Connor & Paunonen (2007). Conscientiousness was reported to be strongly associated with successful post-secondary academic performance, though O'Connor & Paunonen (2007) also cited work by Cucina and Vasilopoulos (2005) who reported very high levels as having a negative effect.

An association between personality and performance of medical students has been suggested, with conscientiousness being found positively related to preclinical UK medical performance (Ferguson et al., 2003) and to achieving a merit or distinction in UK medical finals (Woolf et al., 2013). Adam et al. (2015), observed higher levels of conscientiousness, as well as confidence, moodiness, emotional intelligence and emotional non-defensiveness, when comparing students in the top 20% of a medical cohort's clinical examinations, to those in the bottom 20%. However, a different relationship appeared to exist, in other studies, between conscientiousness and medical students' clinical performance. A five-year cohort study of 76 medical students entering training in 1995, reported a relationship between high levels of conscientiousness and poorer performance on clinical assessments (Ferguson et al., 2003). Similarly, a 5-year longitudinal study of 220 UK

medical students starting in 2003, reported conscientiousness to reduce acquisition of clinical knowledge (Ferguson et al., 2014).

Caution is needed when considering personality research based on medical students, as it is not necessarily generalizable to dental students. This was illustrated by the work of Silberman et al. (1982) who utilised the Myers-Briggs Type Indicator (MBTI) to determine the personality profiles of 217 American dental students. The dental student data were compared to that of students from other disciplines, including medicine, social work and engineering, and observed to be significantly different, though unfortunately the authors did not elaborate on what the differences were.

Similarly, caution is needed when comparing research originating from different countries, as personality traits have been reported to vary between nations. The Chinese version of MBTI was used on 332 applicants to a Dental School with a greater proportion reporting higher Introversion traits than Extroversion traits (Wu et al., 2007). By contrast, a personality test used with 311 applicants to a UK dental school reported extroversion to be a more common trait than introversion (Morris, 2000) and likewise with 120 American dental students (Erskine et al., 1986). A potential flaw with both these pieces of work however, is that they were conducted on applicants to dental school rather than individuals who had received a place at dental school; the personality profiles of these two groups may differ.

No correlation between MBTI personality types and academic performance was reported by Westerman et al. (1989) in their study of four cohorts of first-year American dental students. By contrast, in a different study involving use of the MBTI on 256 American dental students, introverted individuals were reported to perform significantly better on the National Dental Board Examinations, Parts I and II, though they achieved a lower yearly class ranking than extroverted students (Jones et al., 1997). The introverted students were also reported to have had more significant academic difficulties during their four-year training than extroverted students. A longitudinal study of 373 Canadian dental students reported conscientiousness to be predictive of academic performance in the first three years of training, and predictive of clinical performance in years two, three and four (Poole et al., 2007). By contrast, Smithers et al. (2004) reported conscientiousness was not a predictor for academic or clinical success in their study of 145 Canadian dental students, though the Openness to Experience trait was negatively related to clinical performance and a facet of the Openness and the Extroversion traits were positively related.

Perfectionism is an additional personality trait that has been investigated to determine if there is any relationship with student performance. Perfectionism is multidimensional, with a self-oriented form (self-imposed high standards and intense self-criticism) and a socially prescribed form (perception that high standards are imposed by others) described by Mills & Blankstein (2000) citing Hewitt and Flett (1991). In work involving the use of partial correlation analysis with Canadian psychology students, self-

orientated perfectionism was reported to be related positively to motivation and learning strategies, whereas socially-orientated perfectionism, was related negatively to academic performance (Mills & Blankstein, 2000). In addition, socially-orientated perfectionists were less likely to seek help.

1.2.5 Motivation

Student motivation has been reported to affect performance, with different motivation theories described in the literature. An intrinsic and extrinsic form of motivation and amotivation have been described, with intrinsically motivated students being driven from within, through an interest or enjoyment of their subject (Afzal et al., 2010). Extrinsic motivation involves the student receiving an incentive or reward such as money or verbal praise, or the avoidance of a punishment (Dev, 1997) and amotivation involves the absence of motivation (Baker, 2004). By contrast, some psychologists believe motives cannot be divided into two categories, and so favour a multifaceted theory, which recognises several possible motives, such as curiosity, positive self-regard, fear and power (Reiss, 2012).

A questionnaire study involving 342 university students in Pakistan, concluded that intrinsic motivation positively impacted on academic performance and extrinsic motivation negatively impacted (Afzal et al., 2010). A criticism of the study was that 82% of respondents were male, which could potentially skew results, and no details were given as to how academic performance was measured. By contrast, a questionnaire completed by 91 second-year undergraduates at Sheffield University, observed no

relationship between academic performance and extrinsic and intrinsic motivation, nor amotivation (Baker, 2004).

The extent to which a student strives towards the positive feelings of success and away from negative feelings of failure is described as achievement motivation (Busato et al., 2000), with maladaptive patterns of achievement behaviour resulting in students failing to reach achievable goals (Dweck, 1986). Individuals with maladaptive achievement behaviour have been observed to have lower cognitive ability than those without, despite having identical levels of intelligence (Dweck, 1986). This supports the work of Busato et al. (2000), who conducted a series of psychological tests and correlational analyses, with 409 Dutch, first-year psychology students, and observed a positive association between achievement motivation and academic success.

Kearns & Gardiner (2007) reported a questionnaire-based study, investigating the correlation between time-management behaviours and perceived effectiveness, morale and distress among 118 Australian undergraduate and postgraduate students. Students with positive time-management behaviours had higher perceived work-related effectiveness and morale and less work-related distress, with a clear sense of career purpose being the most important time-management behaviour. The authors theorise that it is easier for students to plan out a study schedule and set goals, if they have a clear motivation for study. A weakness of this work was

that no indication of the ratio of undergraduate to postgraduate students was given, which could have a bearing on time-management behaviours utilised.

1.2.6 Stress

A significant body of research has been undertaken surrounding dental student stress, with very high levels experienced, as a result mainly of academic and clinical factors (Elani et al., 2014). The relationship between stress and academic performance has produced conflicting results, with a systematic review of the dental student literature identifying 10 studies showing a relationship and two that did not. A questionnaire-based longitudinal study, reported many UK medical students had raised stress and anxiety levels, though this did not result in poor performance in pre-clinical examinations (Tooth et al., 1989). Ross et al. (2006) and Stewart et al. (1999) failed to find a significant relationship between stress and academic performance in medical students, in Scotland and Hong Kong respectively. Similarly, Sanders & Lushington (2002) found only a weak association in Australian dental students, with the exception of stress caused by faculty and administrative factors. By contrast, Silverstein & Kritz-Silverstein (2010) and Shah et al. (2010) reported that student academic performance decreased as stress scores increased, in American dental and Pakistani medical students respectively. Linn & Zeppa (1984), highlighted the fact that stress presents in different forms and suggested unfavourably perceived stress correlated significantly with poor American medical student performance, in both academic and clinical assessments, though favourable stress showed no similar correlation.

Higher levels of stress have been reported in females by Alzahem et al. (2011), Linn & Zeppa (1984) and Shah et al. (2010), though Pau & Croucher (2003) suggested that females may be more likely to admit to experiencing stress than males. However, other studies have reported males to have similar or higher stress scores than females (Amr et al., 2008 and Kumar et al., 2009). Silverstein & Kritz-Silverstein (2010) established financial worries as being significant stressors and Shah et al. (2010) observed the main student stressors were academic and psychosocial factors, including "high parental expectations" and the "vastness of academic curriculum". In a systematic review of the literature, concerning dental students, the five most commonly occurring stressors were observed to be: accommodation issues, personal factors, educational environment, academic issues and clinical issues (Alzahem et al., 2011). Students at different stages of their undergraduate training have been shown to have different levels of stress, with Alzahem et al. (2013) observing Year 3 Saudi Arabian dental undergraduates having the greatest stress and year 1 the lowest.

Muirhead & Locker (2008) observed Canadian dental students living with parents had higher stress scores than those living elsewhere, and that low teacher support was a significant predictor of stress. Silverstein & Kritz-Silverstein (2010) similarly found inconsistency in teachers' feedback to be associated with a change in stress ratings over time.

Elani et al. (2014) noted high stress levels impacted adversely on individuals' physical and mental health, with Alzahem et al. (2014) observing much

variation in the nature of stress-management programmes used in dental institutions. Gambetta-Tessini et al. (2013) observed social support to be negatively associated with stress, whereas the use of maladaptive coping strategies, such as substance use, was positively associated.

1.2.7 Burnout

Burnout is characterised by emotional exhaustion, cynical attitudes and a tendency to evaluate oneself negatively (Maslach & Jackson, 1981). It has been associated with stressors, including workload and ambiguity in the work environment, and may result in absenteeism, low morale and personal distress (Maslach & Jackson, 1981). A systematic review of 33 studies researching burnout in dentists and dental students, observed younger age, male gender and personality type to be some of the factors commonly associated with an increased prevalence (Singh et al., 2015). A study involving Brazilian dental students and use of the Maslach Burnout Inventory - Student Survey (MBI-SS), observed 17% of the 235 participants, had Burnout Syndrome, with 47% feeling emotionally drained and 75% having lost interest in their studies (Campos et al., 2012). The authors observed a significant relationship between onset of burnout and student performance, though performance appears to have been self-reported by students, which weakens the validity of this observation. A study involving 5647 Columbian dental undergraduates similarly observed seven per cent with burnout, which was associated with older students and those reporting perceived stress related to workload and self-efficacy (Mafla et al., 2015). The authors

explained the findings could not be extrapolated to other dental schools and recommended the use of a qualitative approach to further explore burnout.

1.2.8 Finance

The length of dental programmes, (often five years duration) may contribute to dental students acquiring debts. A 2010 British Dental Association (BDA) survey revealed 89% of final-year students were in debt, with an average (excluding those with no debt) of £25,545 (BDA, 2010). A systematic review of the literature found evidence that personal debt may contribute to mental health problems (Fitch et al., 2011) and Arulampalam et al. (2007) speculated that tuition fees may be related to increased numbers of UK medical students dropping out from their studies. Some participants In the BDA survey stated that debt had affected their health and diet, for example: "*Had to work in my final year – stress has caused health problems, struggled to keep up with studies*" (BDA, 2010 p.13). Sampling was a weakness, as only BDA members were included and only 40% of the sample responded. The 2013 British Dental Association survey, of final-year UK dental undergraduates, observed the average total debt of the 106 respondents to be £24,734 (Kemp & Edwards, 2014). They predicted the total debt for a graduate, from an English dental school, is likely to exceed £60,000 by 2018/19.

A relationship between financial factors and student performance appears to be neither clear nor easily determined; Ross et al. (2006) found no significant relationship between Scottish medical students' debt, hours worked and

academic performance (though students who worried about money had higher debts and performed less well) and individuals from lower socioeconomic classes had higher debts. Cooter et al. (2004), grouped American medical graduates into high, moderate and low socio-economic bands, based on parental income, and reported students in the high-income band performed better during pre-clinical years, though this difference lessened later in the programme. An interview-based study of 62 UK undergraduates, found they generally accepted debt as being a normal aspect of student life with repayment being a future worry (Harrison et al., 2015).

Students often undertake paid work during their studies. Determining whether such work directly affects student performance is problematic due to confounding issues; for example, time spent working may result in students spending less time socialising as opposed to less time studying (Triventi, 2014). Moulin et al. (2013) reported that researchers often demonstrate a U-shaped relationship between poor academic performance, or quitting university, and time spent in paid work (with those doing no paid work or large amounts fairing badly). A longitudinal study, following Canadian students for seven years, however found no difference in academic performance between those students undertaking just a few hours of paid work and those not working at all (Moulin et al., 2013). This finding contrasted that of Triventi (2014) who observed a negative effect on progression, following allowance for variables such as student motivation, in 'low intensity' workers (averaging 11.3 hours per week). In their research

involving Italian students, Triventi (2014) observed that academic progression was greatly affected in those ‘high intensity’ workers (spending an average of 35.4 hours in paid work per week), though interestingly there was only a weak relationship between academic progression and time spent studying. The work involved first-year students reading a variety of degree subjects and so may not be generalizable to students in other years of study, or to dental students.

1.2.9 Support and pastoral care

Student support and pastoral care is a topic that has received much attention by researchers. Burk & Bender (2005) explained student support can be categorised as either formal or informal and is usually provided by peers, the university or other professional bodies. It is often unclear however, which of these types of support individuals need (Morosanu et al., 2010). A survey of 97 first-year American dental undergraduates observed emotional problems, associated with disappointing academic performance and with stress, were the two problems ranked as most severe from a list of 17 problems (Burk & Bender, 2005). The students in this study found informal peer support to be more effective than other internal support measures, though outside support resources were considered the most effective of all and were used more commonly by females than males. A limitation of this work was that it was undertaken with just one cohort of students at a private dental school and so generalizability of results is questionable.

Poorly performing students may lack a support network of peers; Todres et al. (2012) failed to establish a link between the need for UK medical students to re-sit examinations and health, money or other social factors, though re-sitting students appeared to have difficulties engaging positively with their peers. Yorke (2000) made a tentative observation, in a study of students dropping out from university, that those strugglers undertaking clinical and pre-clinical subjects lacked support. Yorke (2000) did not explain however whether this observation related to peer support or university support.

The influence of peers can be significant. Woolf et al. (2012) found that those UK medical students having close friendships with high-performing peers exhibited improved performance in academic assessments. A weakness of this finding was that it could have been associated more with friends belonging to the same teaching groups.

Interviews with students who had withdrawn from university, established some had experienced problems with their personal tutors, including difficulties approaching them or lack of availability (Wilcox et al., 2005) and Morosanu et al. (2010) suggested that university staff should adopt some of the characteristics of student peer support in their own support of students, including frequency of contact and equality. Such an approach would also potentially improve belongingness, as discussed in Section 1.2.2.

1.2.10 Attendance

A link between student performance and attendance has been reported in a regression analysis involving 338 psychology undergraduates. Dollinger et al. (2008) reported that attendance during the course predicted examination performance, with good attendance having a greater positive effect on the high-performing students than the weaker students. Similarly, Westerman et al. (2011) reported a relationship between attendance and academic performance in an analysis of undergraduates on management courses, with poor attendance having a greater negative effect on the weaker students than on the high-performing students.

1.2.11 Teaching, learning and assessment

1.2.11.1 Learning styles and learning environment

A student's "learning style" refers to the way in which s/he normally approaches learning, with several different styles described in the literature (Kalaca & Gulpinar, 2011); a systematic literature review of learning style models identified 71 such models "worthy of consideration" (Coffield et al., 2004 p.139).

One learning style model describes individuals as being activists, reflectors, theorists or pragmatists, with an individual's particular style determined using the Mumford's Learning Styles Questionnaire (LSQ) (Wilkinson et al., 2014 citing Honey & Mumford, 1986). Some models also incorporate learning strategies and approaches (Coffield et al., 2004 p.90) with for example surface-level and deep-level processing described (Coffield et al., 2004 p.91

citing Marton and Säljö, 1976). A deep learning style, where students obtain a personal understanding of the issue in question, is usually considered to result in better learning outcomes than surface learning where students learn without understanding (Baron, 2002). Strategic approaches involve an awareness of examination requirements and an ability to organise study and time-manage well (Walker et al., 2010).

Tooth et al. (1989) observed no link between deep-learning styles and performance in pre-clinical students, though strategic and surface learning correlated with good and poor performance respectively. Woolf et al. (2013) found strategic learners were more likely, than deep or surface learners, to achieve a merit or distinction in finals examinations (comprising equally weighted written and clinical components) and McManus et al. (1998) found both strategic and deep learning styles associated with success in UK medical final examinations (written and clinical combined). Similarly, Duff et al. (2004) observed deep and strategic approaches correlated positively with academic performance and a surface approach negatively, in their investigation of 146 Scottish social science undergraduates. A surface learning style may be adopted by students that perceive their workload is heavy (Busato et al., 2000). Surface learning is also the likely outcome from a transmission mode of teaching, whereby the teacher simply dispenses knowledge; such an approach is commonly found in universities (Kinchin & Hay, 2007).

Correlation between examination performance and LSQ results was investigated, with 260 first-year medical and dental students, in Belfast (Wilkinson et al., 2014). The majority of students (65%) were observed to be reflectors and in most analyses there was no correlation observed between learning style and examination performance (Wilkinson et al., 2014). The examination formats included multiple choice, short-answer question and OSCE.

The results of studies, incorporating learning style assessments, need to be considered with caution as there is a lack of evidence base surrounding their use in educational practice (Pashler et al., 2009). Similarly, there is a lack of evidence demonstrating that an individual's learning style remains consistent or that their cognitive function is more effective if their preferred style is used (Willingham at el., 2015). Following a detailed examination of the 13 "most influential and potentially influential" learning style models, Coffield et al. (2004 p.139) identified only three which approached the psychometric criteria required to redesign pedagogy; the Allinson and Hayes, Apter and Vermunt models.

Todres et al. (2012) identified three core themes whilst exploring medical students' perceptions of factors influencing their academic performance; engagement with learning, reflections on learning methods/experiences and application of learning to future practice. Re-sitting students tended not to actively engage with learning and saw assessments as performance goals

and a means-to-an-end, compared to high-achieving students who saw them as building blocks towards future practice.

Tinto (1997) described the university classroom as a “community of learning” and that for some students it was the only place where academic and social integration occurred. Tinto (1997) observed that students involved in shared learning experiences in their university classrooms often continued their peer learning outside the classroom, within study groups, and explained that this enabled students to combine the academic and social aspects of life and that they found such experiences very valuable, spending more time studying as a result.

Chairside teaching allows students to be active in their learning, permitting construction of knowledge (McMillan, 2011). In considering professional practice knowledge, theory and practice should be considered simultaneously, as practice and knowledge operate interdependently; failure to do so may result in ineffective clinical decisions (Higgs et al., 2001). A mixed-methods study, including use of focus groups with 24 fourth-year dental students, determined stakeholder perceptions of chairside teaching and learning at Cardiff University (Sweet et al., 2008). It was established that students strongly viewed chairside teaching as a means of learning “by doing”. There is a lack of evidence however, to suggest chairside teaching involves different underlying philosophies to any other form of teaching method (Kinchin & Hay, 2007).

A questionnaire-based study, conducted by Davies et al. (2009) observed that dental graduates, when reflecting on time spent in a simulated general dental practice environment, rated this learning experience highly. Several UK Dental Schools have developed outreach programmes, with clinical teaching conducted in a community setting, including Manchester, Liverpool, Newcastle and Belfast (Elkind, 2002). Such programmes are designed to help progression from the dental school environment to that of the community and appear to have been received enthusiastically by students, for example at Cardiff University (Lynch et al., 2010a) and KCLDI (Radford et al., 2014). A structured proforma completed by 257 final-year Cardiff University students over a five-year period, reported availability of a trained nurse and ready access to helpful / approachable teaching staff as being the two most common 'likes' about their outreach experience (Lynch et al., 2010a). A strength of this work was the 95% response rate which increased the validity of the findings. A self-report questionnaire, completed by 55 final-year students at the same outreach centre, also reported an improvement in confidence, for 35 of the 36 clinical tasks itemised, from start to end of their outreach placement (Lynch et al., 2010b).

1.2.11.2 Teachers

The personal qualities of teaching staff and their teaching ability can influence students' progression. Dental students at Cardiff University voiced clear opinions, during focus groups, as to what constituted good chairside teaching and the value of teacher training (Sweet et al., 2008). Some behaviour was viewed positively, for example teachers providing feedback,

and some was considered obstructive to learning, such as teachers leaving clinic early.

American dental students' perceptions of effective learning experiences were determined, in an interview-based study (Victoroff & Hogan, 2006). Three themes emerged; instructor characteristics, learning process characteristics and learning environment, with positive teacher characteristics including approachability, willingness to give feedback, enthusiasm and patience. A survey of American dental students' opinions of qualities they liked and disliked in a clinical teacher also produced three themes; character, competence and communication (Jahangiri et al., 2013). The character theme was the most cited and included the categories of caring, empathy, fairness, happiness and patience (Jahangiri et al., 2013). These findings supported those of Anderson et al. (2011) whose questionnaire study, involving final-year New Zealand dental students, reported their belief that learning was facilitated by approachable, non-confrontational and engaged staff. A teacher's effectiveness may vary from one environment to another however (Jahangiri et al., 2013). The generalizability of research involving student perceptions, as described above, is also somewhat limited due to factors such as variations in staffing at different schools and ratio of full-time academics and part-time general practitioners.

Universities may employ excellent researchers in the belief that they will also be better teachers, however this is not necessarily the case (Kinchin & Hay, 2007 citing Hattie and Marsh, 1996). Uz Zaman (2004) reviewed the

relationship between teaching and research and was unable to conclude that a strong link existed between the two, particularly at undergraduate level. Staff may also receive varying levels of support and training in different schools. A questionnaire, to determine UK dental schools' engagement with peer review of teaching (PRT), was completed by all 16 schools during 2015 (Cunningham & Lynch, 2016). PRT was undertaken by 14 schools, though only four stated that all their staff were engaged.

1.2.11.3 Feedback

A review of 250 studies concluded that good, extensive feedback, following formative assessments, increased student engagement and resulted in higher quality learning (Agius & Wilkinson, 2014 citing Black and Wiliam, 1998). Similarly, a synthesis of 12 meta-analyses, including 196 studies related to school classroom feedback, demonstrated student achievement was improved by the use of effective feedback (Hattie & Timperley, 2007 citing Hattie, 1999). The synthesis observed different types of feedback had varying degrees of success; the most beneficial involved an explanation of how to undertake tasks more effectively, whereas simply giving praise proved less effective. The work was part of a very large study, including approximately 20 to 30 million school children, which gave validity, however the results may not necessarily be entirely generalizable to the university or clinical environment. In addition to the benefits outlined above, Poulos & Mahony (2008) explained good feedback was particularly important for first-year students, as it helped their transition to university, by providing emotional support.

There is variation in feedback provision between different universities, dependent upon factors such as number of students, cultural environment and student background (Perera et al., 2008). The variety of methodologies used to investigate feedback, make comparisons between studies difficult (Agius & Wilkinson, 2014) with little high-quality evidence to support a particular method for promoting learner-centred feedback (Johnson et al., 2016). Agius & Wilkinson (2014) undertook a narrative literature review of 21 studies, and identified four themes related to undergraduates' expectations and teachers' views of written feedback; quality, quantity and location, 'feed-forward' (giving advice for improvement) and timeliness. An Australian study, involving the participation of Faculty of Health Science students in four focus groups concluded that the credibility of the educator providing the feedback was also important (Poulos & Mahony, 2008).

Providing clinical feedback presents unique challenges compared to that given following written assessments. Indeed, a review of the literature by van de Ridder et al. (2008) found no clear definition of the term "feedback" in clinical education, with the authors proposing their own: 'specific information about the comparison between a trainee's observed performance and a standard, given with the intent to improve the trainee's performance'. Students demand good feedback following clinical work however; a questionnaire-based study involving New Zealand dental students demonstrated their wish for explicit, constructive clinical feedback (Anderson et al., 2011).

Following a review of the literature, involving 170 articles, Johnson et al. (2016) used a Delphi technique to establish expert consensus on a series of statements related to high quality clinical feedback. The authors identified 25 educator behaviours associated with high quality feedback and developed four associated themes: the need for the learner to 'do the learning', the autonomy of the learner, the importance of the relationship with the educator and need for collaboration between learner and educator (Johnson et al., 2016).

In addition to providing good feedback to students, feedback received from students is also important and can be used to help identify and reduce potential problems with progression. Youngson et al. (2008) distributed a questionnaire to three successive academic years of clinical dental students, at the University of Liverpool, to obtain feedback on the quality of teaching provided by their clinical supervisors. The intention was to provide feedback to staff, and the authors demonstrated the technique resulted in an improvement of clinical teaching. The number of responses was high (638) however the authors explained the 50% response rate achieved in 2005 and 2006 (compared to 100% in 2004) was a limitation of the work and possibly related to the method of questionnaire distribution.

1.2.11.4 Lectures

Teaching is commonly delivered in the form of lectures. In a questionnaire based survey of 228 American dental students, visual learning was observed to be the favoured learning preference, compared to iconic (reading and writing), kinaesthetic (smell and touch) or auditory (Murphy et al., 2004). The authors suggested lectures should thus contain strong pictorial content, though note that a student's preference does not necessarily correlate with improved academic performance. The response rate was 46.2% which reduced the validity of the findings however.

"Lecture capture" involves the recording of lectures, which can then be watched by students at a later time. Attendance at "live" lectures is often poorer as a consequence of lecture capture, and examination performance usually not improved (Williams et al., 2016) though some have found an association with both decreased and increased academic performance (Bos et al., 2015). An investigation of 545 American biology undergraduates attending "live" lectures, observed little improvement in performance, following additional use of lecture capture (Williams et al., 2016). Confusion with the content of "live" lectures, or inability to keep up, were the most common reasons for using lecture capture, with the greatest users observed to be Asian and female students (Williams et al., 2016). An assessment of lecture capture use by 396 Dutch first-year psychology students, observed 82 (21%) neither attended the "live" lecture nor used lecture capture, with use of the latter being greater than the former by the remaining students (Bos et al., 2015). The authors noted that the effect of lecture capture on

examination performance was dependent upon the nature of the assessment. Students who attended “live” lectures performed better in assessments of knowledge base, with a significant further improvement in performance observed in those who also used lecture capture. Use of either lecture format had little impact on performance in assessments involving higher order thinking however.

1.2.11.5 e-learning

Student preferences for teaching methods may change with the introduction of new approaches, such as e-learning. A wide variety of online learning tools are available, including compact discs, digital video discs (DVDs) virtual learning environments and haptic devices (Schönwetter et al., 2010). Forms of social media, such as Twitter, have also been utilised successfully in dental education (Gonzalez & Gadbury-Amyot, 2016). A self-administered questionnaire-based survey of 386 Croatian dental students observed a highly positive attitude towards e-learning by both male and female students (Brumini et al., 2014). This supports the results of a questionnaire survey of 57 third-year UK dental students, though students also found face-to-face lectures an important means of maintaining contact with staff (Gupta et al., 2004). Similarly, Peroz et al. (2009), using a questionnaire with a 10-item Likert scale, reported dental students enjoyed a traditional lecture more than e-learning and felt e-learning should be used as a supplement rather than replacement for traditional lectures. Caution is needed when drawing conclusions from such research however, as students’ views will be

dependent upon the quality of the e-learning resources, which may vary from discipline to discipline or school to school.

A randomized controlled trial comparing knowledge acquisition obtained from e-learning with that from conventional lectures, in 85 pre-clinical dental students, observed lectures were better in the short term, though there was no difference long-term (Peroz et al., 2009). Similarly, a crossover controlled study involving 35 third-year dental students, observed students attending a live periodontal lecture performed significantly better in a written assessment, than those watching a video (Ramlogan et al., 2014). The students preferred the video to the lecture however, and 97% favoured a combination of the two (Ramlogan et al., 2014). A weakness of the study was that it comprised 80% females and it is feasible that gender differences may exist. In addition, the videos were only viewed once, and if additional views were permitted, performance may have improved. Conversely, a systematic review and meta-analysis of nine studies, involving undergraduate orthodontic teaching, concluded computer-assisted–learning was as effective as conventional methods, adding a small though significant increase in knowledge acquisition (Al-Jewair et al., 2009).

1.2.11.6 Assessments in Dentistry

The General Dental Council (GDC) describe assessment as "...the process or exercises which measure and record a student's progress towards achieving the learning outcomes necessary for completion of their programme and registration as a dental professional ... (assessments) ...

enable staff involved in the delivery of a programme to form an opinion of student performance." (GDC, 2015a p.8). The term "performance" is used frequently, as outlined in the literature review above, with no clear definition given. Chuenjitwongsa et al. (2016) citing Chambers and Glassman (1997) define "performance" in dentistry, as a "specific sample of ability under specific conditions" and explain confusion remains in the literature, with the term occasionally used interchangeably with "competence" and "competency". Gipps (2012) indicates there are other interpretations of performance; one interpretation views performance as "what is actually done under existing circumstances" as opposed to competence, which is "what a person can do under ideal circumstances".

Assessment drives student learning, allows appraisal of educational efficacy and helps protect patients by ensuring minimum standards are met by graduates (Norcini et al., 2011). Teaching does not always lead to learning however (Hay, 2007) and poorly discriminatory assessment methods may reward such non-learning (Kinchin et al., 2008a). Similarly, assessment may not test subject understanding, leading to superficial learning, hence assessment should be developed in conjunction with pedagogy (Kinchin et al., 2008b). Students commencing the dental programmes at KCLDI undertake a variety of Bachelor of Dental Surgery (BDS) assessments during their training, including in-course assessment (ICA), online multiple-choice papers, written papers and objective structured clinical examinations (OSCEs). This is in line with a statement produced by the Association for Dental Education in Europe (ADEE), which included the recommendation

that multiple methods of assessment should be used (Manogue et al., 2011). Howley (2004) reported that multiple, mixed forms of assessment were required to assess clinical competence and Schuwirth & van der Vleuten (2004) recommended the use of a range of methods, with each customised to the specific requirements of the assessment. However, the validity of assessments was context specific, with no one method being perfect. This view was supported by van der Vleuten (2000) who suggested significant errors were made in performance assessment at final examinations. The GDC similarly reported, in its Annual Review of Education 2014-2016, that several inspectors "...noted that marking and grading schemes were unclear and in need of review to improve the integrity of assessment outcomes..." (GDC, 2017 p.12).

1.2.11.6.1 OSCEs

The objective structured clinical examination (OSCE) is used widely around the world, at all levels of education (Patrício et al., 2009) and is designed to test application of clinical knowledge rather than demonstrating factual knowledge (Graham et al., 2013). A systematic review, of 1065 studies, concluded the OSCE to be an appropriate means of assessing medical education and different learning outcomes across a range of specialities (Patrício et al., 2013). The advantage of the examination is its objective nature, compared to other clinical tests, thus helping to overcome variations that exist between individual patients or examiners (Mossey et al., 2001). OSCEs have the potential to provide useful feedback to students, though the standard setting methods used need careful consideration, with different

techniques producing different outcomes (Kaufman et al., 2000) and the examinations sometimes fail to reflect clinical reality (van der Vleuten, 2000).

A Best Evidence Medical Education (BEME) systematic review of 1065 medical studies, between 1975 and 2009, recommended the use of the OSCE, describing it as a fair examination, capable of driving teaching and learning (Carneiro, 2012 p.112). A lack of standardisation, in the reporting of OSCE research, can make interpretation of findings difficult however (Patrício et al., 2009). A systematic review of literature related to OSCE checklists (used to assess communication skills), similarly established difficulties making comparisons between reviewers and recommended use of a standardised instrument across institutions (Setyonugroho et al., 2015).

1.2.11.6.2 Written examinations

KCLDI uses a range of written examination formats, including traditional essays, short-note and multiple-choice questions (MCQ) with each format having advantages and disadvantages (Schuwirth & van der Vleuten, 2004). Van der Vleuten (2000) considered that written examinations test knowledge of facts rather than their application, with Näpänkangas et al. (2014) similarly commenting that written examinations are poor for the assessment of clinical skills and competencies. Essay questions involve students processing information rather than simply reproducing it, however they have low reliability (Schuwirth & van der Vleuten, 2004). Brown (2010) reported low agreement between markers and low correlation when the same marker re-scored an identical essay, suggesting example answers and scoring guides

should be provided to improve reliability. Similarly, Schuwirth & van der Vleuten (2004) proposed the same marker should mark all the answers of a particular essay question to increase reliability; KCLDI use these practices in their essay-based assessment process. Norcini et al. (2011) suggested the use of written examinations was generally consistent with the surrounding evidence base, though the evidence base related to standard setting and score aggregation needs further development.

Schuwirth & van der Vleuten (2004) explain the response format is less important than the nature of the question asked, when determining which competency is tested. The authors noted that the questions asked in short-answer style questions can usually be asked in the more reliable MCQ format, except where the spontaneous generation of an answer is required (Schuwirth & van der Vleuten, 2004).

MCQ examinations comprise a question and choice of answers, with no psychometric rule determining how many options should be given (Schuwirth & van der Vleuten, 2004). MCQs can cover a wide range of content, they correlate well with other measures of student performance and are considered to be reliable measures of knowledge and problem-solving (McCoubrie, 2004 and Middlemas & Hensal, 2009). KCLDI employs the extended-matching style of question (EMQ) for many of its MCQ examinations, as recommended by McCoubrie (2004) to improve fairness.

1.2.11.6.3 Assessment of clinical competencies and competence

Epstein and Hundert (2002) define professional competence as “the habitual and judicious use of communication, knowledge, technical skills, clinical reasoning, emotions, values, and reflection in daily practice for the benefit of the individual and community being served”. Fish and Coles (2005) similarly explain “competence is concerned with a holistic notion of professional practice” and Chuenjitwongsa et al. (2016) as “a capability which covers a broad scope of professional attributes”. A “competency”, by contrast, is a particular skill, acquired in order to complete a task (Fish and Coles, 2005) or “one stage within the process of becoming an expert” (Chuenjitwongsa et al., 2016). Fish and Coles (2005) explain that the competency-based approach to training ignores the importance of context and simply involves acquiring a series of competencies deemed appropriate for the job in question.

The demonstration of a student’s professional competence is complicated, necessitating elaborative procedures (Gipps, 2012) and should be learner specific (Dawson et al., 2016). Dawson et al. (2016) suggest the process should involve sophisticated methods of longitudinal data collection to demonstrate consistency and breadth of performance. Determination of clinical competence is essential during undergraduate training, as there is a duty to protect the public; with Dawson et al. (2016) explaining that demonstration of competence, in domains such as clinical, communication, professionalism and management and leadership are essential when making defensible decisions on student progress.

Chuenjitwongsa et al. (2016) argue that further work on competency-based education is required, as focussing solely on performance may not fully demonstrate competence. Assessment of clinical competencies can be problematic, with a “failing to fail” tendency by some staff having been identified in the literature (Cleland et al., 2008). A focus group study, involving 70 educators at UK medical schools, identified different factors related to the “failure to fail”, including tutor attitudes towards individual students, skills and knowledge and environmental constraints (Cleland et al., 2008). A qualitative study, involving interviews with 17 clinical dental staff, reported similar results, with staff reporting difficulties assessing students (Bush et al., 2013). Shielding students from negative feedback to avoid loss of confidence and de-motivation was described by some, as was a wish to avoid confrontation.

1.2.12 Summary of Section 1.2

Once students have entered university a wide range of factors have the potential to influence their progression and performance. The transition period between school and university life is a particularly important stage having the potential to cause progression difficulties, though little research has been undertaken in this area with dental students. The nature of students’ living arrangements has relevance to progression; those living in their parental home, or a distance from university, may experience difficulties forming friendships and developing a sense of belonging, whereas students living in halls of residence may experience difficulties due to noise levels or sleep disruption. The evidence base is weak however, in part due to the

contextual differences between different universities and accommodation types. Formation of friendships is important, with several studies observing the benefit of peer support and that a lack of such support may be associated with progression difficulties.

Personality-type has been associated with performance, with conscientiousness in particular linked with increased academic performance, though findings were dependent upon the subject studied and the nationality of the students.

High stress levels have been observed in dental students, and a wide range of stressors demonstrated, though contextual differences between universities and countries make generalisation of results to the KCLDI student problematic. It is unclear whether stress levels affect performance. Similarly, many dental students have high levels of debt, however there is a lack of evidence to suggest this is directly affecting performance. Academic performance has been shown to be adversely affected in those students who spend large quantities of time undertaking paid work, however this is arguably of less relevance in the dental context, due to their demanding curriculum.

Dental students favour certain traits in their teachers, including approachability and patience and expect them to provide good feedback. Feedback has clearly been demonstrated as being beneficial to learning, however the nature of feedback following clinical procedures will differ from

that following academic assessments, and there appears to be a mis-match between student expectations and what can realistically be delivered by dental schools. Teaching environment and resources are relevant to progression, with dental outreach centres viewed very favourably. Students are generally positive about the use of e-learning and lecture capture, though the evidence seems to suggest that they should be used as a supplement, rather than replacement, of traditional methods. No one form of assessment is perfect, with multiple methods required to satisfactorily determine students' academic and clinical ability, with demonstration of competence particularly complex.

1.3 Non-completion of degree

A group of students will always exist who fail to progress and leave their university course. The university may terminate a studentship, for example due to an individual's poor academic performance, or a student may leave of their own volition, due to personal reasons or a dislike of the course.

Efforts have been made in the higher education sector to reduce the number of students who fail to complete their degrees. The rate of non-completion for full-time students has dropped from 14% to 10% over the 10-year period from 2003/4 to 2013/14 (HEFCE, 2015d) with 99.0% of pre-clinical dental students, at the end of the 2012-2013 academic year, continuing their studies (HEFCE, 2016). The figure for dentistry was similar to pre-clinical medicine (97.4%) and high compared to other subjects; for example, just 87.4% of architecture students, 92.8% of mathematics students and 91.4%

of biology students continued into their second year of study. Factors related to an increased probability of non-continuation at the end of year 1, in 2010 to 2011, included being a mature entrant, male, and black, with Chinese students having the lowest rate of non-continuation (HEFCE, 2013).

A student's passage through university has been described in three stages; separation, transition and incorporation, all of which may overlap or occur in a different sequence, however failure to successfully navigate any of them may lead to university drop-out (Tinto, 1988). Students may, for example, struggle to separate themselves from their home community and fail to socially integrate at university as a result (Tinto, 1988). The three stages described, potentially pose even greater challenges for individuals who are not entering university straight from school, for example those taking a gap-year (Tinto, 1988).

Yorke (2000) undertook a survey of students that failed to complete their studies, from a range of higher education programmes in England, and observed that dissatisfaction with the quality of their university experience was a notable finding. Males were observed to be less committed to their studies, found their programmes more difficult and were more likely to complain of a lack of study skills compared to females. The participants included full and part-time students from a range of subjects and so this finding may not be generalizable to dentistry. Yorke (2000) did however observe that "making the wrong choice of study" was least commonly stated as a reason for non-completion, by students in subjects allied to medicine.

Adam et al. (2015) undertook a five-year longitudinal cohort study of UK medical students and observed 11 students (8%) left the programme prematurely. The non-completing students scored highly on optimism and anti-social tendencies.

A review of the nursing literature between 1999 and 2011 established four factors having the potential to impact on academic performance and attrition; demographic, academic, cognitive and personality/behavioural (Pitt et al., 2012). Attrition was more likely in younger students, those with poorer academic qualifications at admission, students with weaker levels of critical thinking skills and those who did not seek support. A retrospective cohort study was conducted by Wray et al. (2012), comparing 695 UK nursing student characteristics with their progression through year one. The authors observed older students were more likely to progress into year two than younger peers, and students who did not live locally, during holiday periods, were less likely to progress. The causes of attrition from nursing courses currently remain unclear, with most individuals being at risk for one reason or another. Similarities exist between dental programmes and nursing programmes, both involving long terms, clinical pressures and the need for professionalism. The nature of the successful applicant to dental school differs greatly from that to nursing however, in terms of academic qualifications, and so direct comparisons between the two programmes are difficult.

A retrospective cohort study reported the reasons for 27 students to have been dismissed, from an American dental school, between 1998 and 2008 were; 12 for personal reasons, 10 for academic factors, three for behavioural problems and two for medical issues (Ballard et al., 2015). The analysis of those dismissed for academic reasons, observed that their academic performance, at admission stage, was comparable to that of their peers, suggesting factors other than intelligence were responsible. The authors similarly explained that 64% of the variation they observed in dental school academic performance was not accounted for by admissions criteria (including prior academic attainment), suggesting that “personalities, life events, etc, also have a major impact”.

Logistic regression analysis of more than 25,000 first-year UK medical students established that students with A-level biology were the least likely to drop out, and each additional grade at biology A-level equated to a 0.86% reduced likelihood of drop out (compared to 0.5% reduction for chemistry and physics) (Arulampalam et al., 2007). Graduates have also been reported to be 2.4% less likely to drop out from their studies compared to those with just A-levels (Arulampalam et al., 2007). Woolf et al. (2013), observed that students failing final examinations were more likely to have been living at home during their third-year and similarly, Arulampalam et al. (2007) found a higher proportion of students living off-campus dropped out of medical school, speculating that they were less able to socially integrate with their peers.

1.4 Longitudinal progression

The literature search found a lack of longitudinal research, specifically designed to track the academic progress of individual dental students through all years of their university degree, relative to that of their peers. Research of this nature tended to compare performance of student groups over a limited time period, or between two time points, as described in detail in Section 1.1. Smithers et al. (2004) for example, observed the academic performance of Canadian first-year dental students to be predictive of their academic performance in second year. Second-year performance was also predictive of clinical and academic performance in third-year, however performance in subsequent years was not studied.

An exploratory in-depth longitudinal cohort study of UK medical students conducted by Adam et al. (2015) followed 146 students through their five-year programme. Data collected included students' academic and clinical performance in year four and five and tutors' ratings of students' interpersonal skills and professional behaviour during year one and two. The tutor assessments were significant predictors of performance in year four and five written and clinical examinations and also of students that left the programme. The written examination result in year one and two, correlated positively with year five written and clinical examinations, though not year four. The study was comprehensive, however a weakness was that it involved just one cohort of students. It is reasonable to expect similarities within the dental context.

McManus et al., (2013c) used the term “academic backbone” to describe the manner in which medical students build on knowledge, understanding and experience as they progress through their education, from GCSE/O-level through undergraduate training and beyond. The authors reported positive, significant correlations between attainment in both academic and clinical examinations across different medical school year groups, in an analysis of data from five cohort studies, from the early 1970s until early 2000s, to support this concept.

1.5 Summary of the literature review.

The literature review established a wide range of factors that have been associated with undergraduate student progression, including accommodation arrangements, financial issues, teaching and learning methods, stress and personality. The exact nature of these associations to dental students is far from clear and in most cases are very context specific. For example, dental schools vary widely in the makeup of their student bodies, such as number of students and the proportion of graduate-entry students. Such differences have the potential to influence findings, reducing the generalisability of the research. Unfortunately, many of the reviewed articles failed to specify such details, making assessment of the validity of their results difficult.

Students’ academic performance is often used as an indicator of progression, though the literature review established that assessment of performance is a very complex area. There are numerous different forms of

assessment used by medical and dental schools, with no one form being perfect. Factors such as the quality of the questions asked (for example the way in which they are constructed and the language used), the means of standard setting and the method of marking have all been described in the literature as having great relevance.

1.5.1 What is missing from the literature?

The literature review established the context-specific nature of research relating to student progression. Factors such as type of accommodation, learning environment, finance and support processes, for example, all have the potential to affect progression. The extent to which such factors affect progression however, varies from country to country, university to university and from programme to programme within a university. A reasonable volume of work has been undertaken on UK medical student and nursing student progression, though little related to UK dental student progression. Similarly, the work undertaken on medical and nursing students often involves undergraduates studying at schools outside London, making generalization of findings to dental students studying within the Capital difficult. Literature surrounding progression of dental students within the context of a London-based institution is missing; as KCLDI is the largest dental school in the UK, such information is important and relevant.

The existing work on student progression is largely of a quantitative nature, in many cases relating examination results to factors such as gender, age and academic achievement pre-admission. Missing from the literature is

much work related to the “student voice” particularly the voices of London-based dental students. Factors perceived by students to affect their progression, may differ from those in the literature identified as affecting examination performance. Students’ examination performance and students’ progression are not necessarily inter-changeable terms and clinical practice and knowledge need to be considered simultaneously, rather than independently as is currently the case in much of the literature. As discussed in the introduction, progression of students encompasses more than simply the factors involved with passing or failing examinations, but includes areas associated with ensuring students achieve their full potential. The only means by which such areas can be identified is by directly asking the students; such work is missing from the literature. In their conclusions, Holmes et al. (2008) comment “.....even a valid admissions process.....is not a guarantee that students will achieve their full potential in dental school.....[curricula refinement to facilitate student development] is an extremely worthwhile area for continuing discussion, investigation, and innovation.”

2 Chapter 2. Theoretical and methodological framework and review of research techniques.

2.1 Methodological and theoretical frameworks

2.1.1 Introduction

The research involved a mixed-methods approach, involving a longitudinal data analysis, questionnaires, focus groups and one-to-one interviews. The beliefs and practices associated with a research style are known as a research paradigm and include the quantitative and qualitative paradigms (Denscombe, 2010). Different philosophical approaches underpin research, including positivism, post-positivism and interpretivism.

Positivism is a philosophical approach, used in the natural sciences, which 'emphasizes discovering causal laws, careful empirical observations, and value-free research' (Neuman, 2006). Positivist research usually involves a quantitative approach and production of objective results (The Open University, 2005) with different forms of positivism having evolved for use within social enquiry, for example 'post-positivism' (Ormston et al., 2014). Post-positivism seeks procedural objectivity (The Open University, 2005) and employs methods used in the natural sciences, however accepts that reality cannot be definitely proved (Ormston et al., 2014).

Interpretivism accepts that there are different ways in which social reality can be perceived and understood and objective research is not possible (Ormston et al., 2014). There are different forms of interpretive research,

including phenomenology, which involves the interpretation of peoples' experiences (The Open University, 2005).

2.1.2 A theoretical framework of progression in which knowledge is integrated with clinical practice

Much of the literature considered student progression in terms of performance at high-stakes examinations, such as end-of-year assessments, often focussing on academic performance, rather than clinical competencies or competence. Such academic assessments help develop the students' "academic backbone" (McManus et al., 2013c) with individuals gradually building their knowledge, experience and understanding as they progress through their education. However, assessing knowledge related to competence/competency is more problematic. Students' performance in assessments are influenced by a wide range of factors, as detailed above. There is therefore a need to link knowledge to clinical practice in what could be termed a "clinical backbone", so that students progress towards acquiring clinical competence.

A body of research also described progression in terms of transitions from one educational context to another and the difficulties some students encounter in the process. The nature of such transitions is complex and includes socio-cultural transitions as well as the physical transition from school to university or pre-clinical to clinical study. Whilst assessments are of great importance, often determining whether students are allowed to progress with their studies or graduate from their programme, Crafter and

Maunder (2012) described the transition journey as being equally important as the outcome.

The theoretical framework underpinning this research is based on the consideration of “progression” in its broadest sense, encompassing all the above; that of the student “journey” through dental school, but one in which knowledge and clinical practice are intimately entwined. The journey thus involves various transition stages, the successful completion of a range of assessments and ultimately demonstration of clinical competence. The theoretical framework acknowledges that a student’s journey is rarely a smooth, trouble-free one. A large number of factors were identified during the literature review as having the potential to assist or hinder progression, with this research investigating those factors in detail.

2.1.3 Methodological philosophy

A post-positivist paradigm underpinned both the longitudinal data analysis and the quantitative aspects of the questionnaire, used during this research, in which procedural objectivity was sought (The Open University, 2005). Interpretivism underpinned the qualitative aspects of the research, including the focus group and interview analyses, with phenomenology having particular relevance, as the analyses involved the interpretation of students’ experiences (The Open University, 2005).

2.1.4 Methodology

The methodological approach adopted in this work involved multiple stages and a mixed-methods approach. The mixed-methods comprised a longitudinal analysis of examination data and use of questionnaires, focus groups and one-to-one semi-structured interviews (Figure 1). Two longitudinal analyses were conducted, one for students that graduated in 2012 and one for those who graduated in 2013 (analysis 1 and analysis 2 respectively).

The questionnaires, focus groups and interviews were conducted in two stages. The first stage involved students who were in BDS1 and BDS5 during the 2012/3 academic year (Questionnaire 1, Focus groups 1 and Interviews 1). The second stage involved students who were in BDS1 and BDS5 during the 2013/4 academic year (Questionnaire 2, Focus groups 2 and Interviews 2). (Figure 1).

The data produced in the longitudinal analyses and questionnaires were of a predominantly quantitative nature, whilst that produced in the focus groups and interviews were qualitative. Thematic analysis was used to analyse the qualitative data.

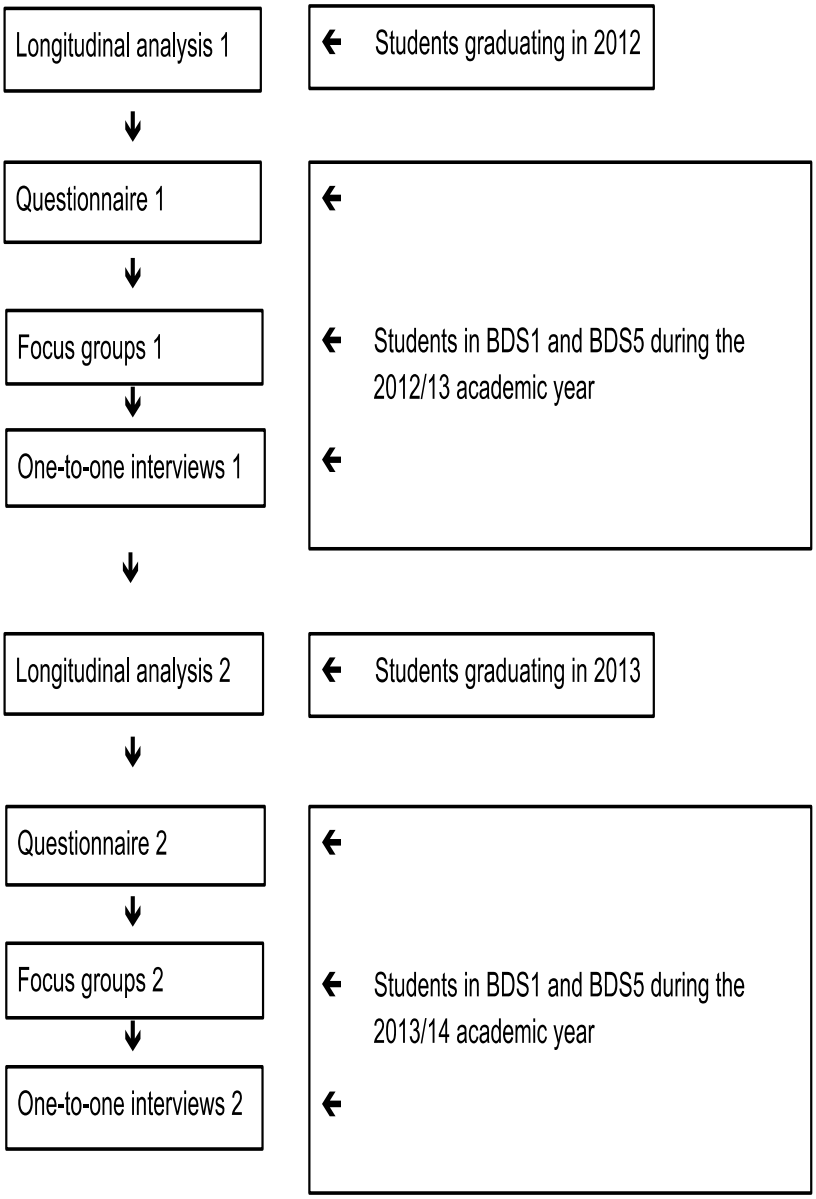

Figure 1. Sequence in which the different research methods were conducted and the year-groups involved.

The research involved eight cohorts of students, which are summarised in Table 2.

- Cohort One (C1): students entering the 5-year programme in 2007/8 (graduating 2012).
- Cohort Two (C2): students entering the 5-year programme in 2008/9 (graduating 2013).
- Cohort Three (C3): students entering the 4-year graduate entry (GPEP) pathway in 2008/9 (graduating 2012).
- Cohort Four (C4): GPEPs starting in 2009/10 (graduating 2013).
- Cohort Five (C5): 5-year programme students who were in the first year of study (BDS1) during 2012/13.
- Cohort Six (C6): 5-year programme students in BDS1 during 2013/14.
- Cohort Seven (C7): 5-year programme students who were in the final year of study (BDS5) during 2013/14.
- Cohort Eight (C8): GPEP students in BDS5 during 2013/14.

Table 2. Length of pathway, year of entry and year of graduation for the eight cohorts studied.

Cohort	Length of pathway (5 = 5-year 4 = 4-year GPEP)	Year of entry to pathway	Year of graduation (N/A if yet to graduate)
1 (C1)	5	2007	2012
2 (C2)	5	2008	2013
3 (C3)	4	2008	2012
4 (C4)	4	2009	2013
5 (C5)	5	2012	N/A
6 (C6)	5	2013	N/A
7 (C7)	5	2009	2014
8 (C8)	4	2010	2014

The longitudinal analyses were conducted on C1, C2, C3 and C4, with analysis 1 involving C1 (5-year programme) and C3 (GPEP) and analysis 2 involving C2 (5-year programme) and C4 (GPEP). Cohort C2 and C4 were in BDS5 during 2012/13 and thus also involved in the first questionnaire, focus group and interview stage (Figure 1 and Table 3). Cohort C5 (BDS1 5-year programme) was also involved in the first questionnaire, focus group and interview stage, and C6 (BDS1 5-year programme), C7 (BDS5 5-year programme) and C8 (BDS5 GPEP) involved in the second questionnaire, focus group and interview stage.

Table 3. Overview of the different research methods used for the 8 cohorts studied. The cells highlighted in green indicate the year/s analysed for each cohort and year-group of students.

Methods	Cohort (Programme)	Year Analysed						
		2008	2009	2010	2011	2012	2013	2014
Longitudinal Data Analysis 1.	Cohort 1 (5-yr)	X (BDS1)	X (BDS2)	X (BDS3)	X (BDS4)	X (BDS5)		
	Cohort 3 (GPEP)	n/a	X (BDS2)	X (BDS3)	X (BDS4)	X (BDS5)		
Longitudinal Data Analysis 2.	Cohort 2 (5-yr)		X (BDS1)	X (BDS2)	X (BDS3)	X (BDS4)	X (BDS5)	
	Cohort 4 (GPEP)		n/a	X (BDS2)	X (BDS3)	X (BDS4)	X (BDS5)	
Questionnaire 1/ Focus Groups 1/ Interviews 1. (BDS1 2012/3)	Cohort 5 (5-yr)						X (BDS1)	
Questionnaire 1/ Focus Groups 1/ Interviews 1. (BDS5 2012/3)	Cohort 2 (5-yr)						X (BDS5)	
	Cohort 4 (GPEP)						X (BDS5)	
Questionnaire 2/ Focus Groups 2/ Interviews 2. (BDS1 2013/4)	Cohort 6 (5-yr)							X (BDS1)
Questionnaire 2/ Focus Groups 2/ Interviews 2. (BDS5 2013/4)	Cohort 7 (5-yr)							X (BDS5)
	Cohort 8 (GPEP)							X (BDS5)

2.2 Review of research techniques

2.2.1 Mixed-methods

The term “mixed-methods research” usually refers to the mixing of quantitative and qualitative approaches within one study (Johnson & Onwuegbuzie, 2004). The exact definition is unclear however with some, for example, also using the term to refer to a mixing of different qualitative methods within one study (Johnson et al., 2007). Quantitative research involves the production of numerical data and their statistical analysis, whereas qualitative research is concerned with analysis of themes of collected data in the hope of gaining insights into, for example, individuals’ thoughts and attitudes (Edmunds & Brown, 2012). The means of assessing the quality of quantitative research is well documented, and includes factors such as appropriateness of sample selection and statistical methods, however there is a lack of such clear criteria for assessing qualitative work (Yardley, 2000).

Use of mixed-methods research is considered controversial or even undesirable by some, who argue that quantitative and qualitative approaches are incompatible, due in part to fundamental differences between the underlying paradigms (Bryman, 2004 pp.451-453). Those holding this view would argue that triangulation between qualitative and quantitative methods is not possible, though the approaches may complement each other (Sale et al., 2002). Use of mixed-methods may cause difficulties for lone-researchers, if methods are used concurrently, and can be a very time-consuming process (Johnson & Onwuegbuzie, 2004).

Pragmatism is considered the underlying philosophy of the mixed-methods approach (Denscombe, 2010) with those favouring its use explaining it has the potential to provide a more complete understanding of the topic investigated, allowing for weaknesses of one method to be overcome by the strengths of another (Johnson & Onwuegbuzie, 2004). Advocates of its use would argue that a form of triangulation is possible, whereby the results of one method can be checked with the results of an alternative method (Denscombe, 2010).

In designing mixed-methods research, consideration needs to be given as to whether to give equal weight to the qualitative and quantitative elements and whether the two elements are conducted simultaneously or sequentially (Johnson & Onwuegbuzie, 2004). If the qualitative element is undertaken after the quantitative, it is possible to probe deeply into any underlying issues related to the quantitative results (Ritchie & Ormston, 2014). Conversely, undertaking a qualitative element first, can assist with questionnaire design and formulating interview schedules (Edmunds & Brown, 2012).

2.2.2 Triangulation

Triangulation is “the combination of at least two or more theoretical perspectives, methodological approaches, data sources, investigators, or data analysis methods”, with mixed-methods research providing methodologic triangulation (Thurmond, 2001). Triangulation helps give a fuller picture of the area of research and provides a form of validation, by allowing corroboration of findings Denscombe (2010). It can however be

problematic, due to the time needed to process large amounts of data (Thurmond, 2001).

2.2.3 Questionnaires

Research questionnaires enable data to be collected from a large number of people, with the potential to generalise findings (Rowley, 2014). Questionnaires can be self-administered, either with or without the researcher being present, or administered by post, telephone, online or as a face-to-face interview (Cohen et al., 2007). If the researcher is present, during completion of a self-administered questionnaire, a good response rate is often achieved and participants have the opportunity to clarify any areas of confusion or uncertainty (Cohen et al., 2007). Care is required however to ensure the researcher's presence does not put undue pressure on individuals to participate or cause them discomfort (Cohen et al., 2007).

Questionnaires must be "designed to collect information which can be used...as data for analysis" (Denscombe, 2010) and focus groups can be used to assist the development of questionnaires, by identifying relevant key topics (Kitzinger & Barbour, 1999). Questions can be open or closed with a combination of both often warranted; the former provides qualitative data of a potentially unexpected and insightful nature and the latter provides quantifiable data (The Open University, 2001). A further advantage of closed-questions is that they are usually more easily and rapidly answered than open-questions, thus increasing likelihood of a good response rate (Rowley, 2014).

Non-response bias may occur if there is a low response rate to a questionnaire (Shih & Fan, 2009) though what constitutes an acceptable response rate is dependent upon the nature of the research (Denscombe, 2010). A rate of 10% may be expected with large postal questionnaires, however it is important to minimise non-completion and to determine any differences between the responders and non-responders (Denscombe, 2010). Non-response may be a result of refusal to participate or because the questionnaire was not received, both of which can lead to bias (Denscombe, 2010). An Australian study posted a six-sided questionnaire to 908 dentists, with two follow-up mailings and a telephone call made to non-responders, in an investigation of non-response bias (Parashos et al., 2005). The researchers reported a significant difference between answers given by early and late-responders, concluding that data received from early and non-responders differed, even in the absence of demographic differences. A good response rate (87%) was achieved, but critically the difference in responses may have been a result of the repeated follow-ups antagonising the individuals concerned, who then completed the questionnaire in an unreliable manner.

A meta-analysis of 35 studies, which compared response rates of questionnaires sent by e-mail, with those sent by post, reported the former to have a 20% lower response rate than the latter; 33% and 53% respectively (Shih & Fan, 2009). The exception was college-based questionnaires where the difference was negligible; this was unsurprising as college students tend to have a higher educational level and are more conversant with e-mail

usage than many other population groups (Shih & Fan, 2009). The length of a questionnaire may also potentially affect completion rates. An eight-sided questionnaire was reported to have similar completion rates to a four-sided one, when administered to two different groups of doctors (Bolt et al., 2014). The response rate did improve from 53% to 64% when questionnaire length was reduced further, from eight to two-sides. A systematic review and meta-analysis involving 38 randomized controlled studies, investigating questionnaire lengths and response rates, reported shorter questionnaires to have better response rates (Edwards et al., 2004). The study also reported that changes to the length of a short questionnaire had more effect than similar changes to longer questionnaires, however a criticism is that the review included very short questionnaires, of postcard size, which may be inappropriate for many studies.

Questionnaire respondents will interpret questions in different ways, thus care is needed, when interpreting findings, that they are viewed as a means of understanding a situation, rather than as hard facts (Rowley, 2014).

2.2.3.1 Questionnaire scales

Categorical and / or continuous response scales may be used in a questionnaire, with the latter, for example, including scales where respondents indicate their strength of agreement with a statement (Streiner et al., 2015). If interval or ratio data are generated, these allow use of parametric statistics and calculations of means and standard deviations, whereas categorical data will be analysed using non-parametric techniques

(Streiner et al., 2015). Non-parametric techniques may also be used when sample sizes are small (Petrie & Sabin, 2009).

Likert scales measure the strength of feeling individuals have about a specific issue (Bryman, 2004) and are bipolar, with descriptors ranging from a negative to a positive feeling (Streiner et al., 2015). Adjectival scales, by contrast, are unipolar with descriptors usually ranging from zero to maximal strength of feeling (Streiner et al., 2015). The number of scale items required to maximize reliability is unclear, with studies producing conflicting results (Chang, 1994), though Streiner et al. (2015) suggest the minimum number should be five to seven, with people often unable to discriminate if more are used. The interval between items on a scale are not necessarily equal (Jamieson, 2004), however it is unclear whether the statistical analysis should employ parametric or non-parametric methods (de Winter & Dodou, 2010). A comparison between use of t test (parametric) and Mann-Whitney-Wilcoxon (non-parametric) for five-point Likert scales concluded both to be equally valid (de Winter & Dodou, 2010).

2.2.3.2 The Perceived Stress Scale

The Perceived Stress Scale (PSS) was developed to help investigate the relationship between stress and pathology by measuring “the degree to which situations in one’s life are appraised as stressful” (Cohen et al., 1983). The scale originally comprised 14 questions (PSS14), related to events that had occurred in the previous month, and was designed to be completed in a few minutes and easily scored (Cohen et al., 1983). A high PSS score

identifies individuals at potential risk of future distress, though does not equate to a high score on a standard psychological distress scale (Cohen & Williamson, 1988). A four-item scale was developed (PSS4) for use in telephone interviews and a 10-item scale (PSS10); all three scales were observed to have adequate internal reliability, with PSS10 having the highest Cronbach alpha coefficient, at .78, and thus recommended for use where time allows. Roberti et al. (2006) provided additional psychometric support for the PSS10, concluding it was a reliable and valid instrument, following use with 281 American university undergraduates.

The PSS10 was used in three American national surveys, during 1983, 2006 and 2009, with the mean score for gender gradually increasing over this period, to a value in 2009 of 15.5 (±7.4) for males and 16.1 (±7.6) for females (Cohen & Janicki-Deverts, 2012). Females had higher PSS10 scores than males in all three surveys, and the values increased with decreasing age, education and income. A Cronbach alpha coefficient of .91 was reported for the PSS10 when utilised in both the 2006 and 2009 samples.

The PSS has been used to assess levels of perceived stress in dental students, with for example PSS14 used by Singh et al. (2011) and PSS10 by Pau & Croucher (2003), Silverstein & Kritz-Silverstein (2010), Gambetta-Tessini et al. (2013), Al-Sowygh (2013) and Dogaru et al. (2013).

2.2.4 Focus groups and one-to-one interviews

A focus group is comprised of a group of individuals plus a moderator, whose role it is to facilitate participant discussion about a particular topic and to witness interaction between members (Denscombe, 2010 and Finch et al., 2014). Focus groups provide "...a means of listening to the perspective of key stakeholders and learning from their experiences of the phenomenon" (Halcomb et al., 2007).

An interview guide, comprised of an initial question and some follow-on questions, provides a focus to the discussion (Asbury, 1995) though there is no agreement between researchers on what constitutes "good practice" when designing a focus group, due to different epistemological viewpoints (Freeman, 2006). A group's composition, the purpose of group interaction and generalizability of results are all areas treated in different manners by researchers (Freeman, 2006) and a systematic review of 10 focus group studies, reported contextual factors were only mentioned in a limited fashion in the studies' results and discussion (Orvik et al., 2013). A detailed description of contextual factors, help provide transparency, generalizability and an indication of methodological quality (Orvik et al., 2013). Similarly, there is limited specific information in the literature concerning the most appropriate way in which to analyse focus group data (Onwuegbuzie et al., 2009). Analysis of full transcripts provides a more thorough approach than use of shortened transcripts, or note-analysis and is the method Onwuegbuzie et al. (2009) suggest is used by inexperienced researchers.

The literature gives contrasting advice as to the ideal size of focus groups with Denscombe (2010) recommending six to nine participants, Cousin (2009) four to twelve, Edmunds & Brown (2012) four to eight, and Morgan (1997) having conducted groups varying in size between three and twenty participants, depending upon research purposes. Too small may provide insufficient variety of information and too large may result in participants being reluctant to contribute freely (Onwuegbuzie et al., 2009). Participants may be reluctant to discuss certain issues in a group setting however (Halcomb et al., 2007) with some individuals being naturally quiet or uncomfortable with the groups' composition (Finch et al., 2014). Similarly, Michell (1999) observed that using focus groups as the sole qualitative method may be inadvisable, whereas combining them with interviews, would ensure that 'silent voices' are heard.

One-to-one interviews involve the researcher and one interviewee, enabling more in-depth analysis than a questionnaire (The Open University, 2001). Interviews can be structured, semi-structured or unstructured, with the semi-structured type allowing specific questions and topics to be covered, but flexibility, such that interviewees can discuss other relevant areas of interest (Denscombe, 2010). It is important for the interviewer to establish a rapport with the interviewee, which may involve progression through a sequence of phases: apprehension, exploration, co-operation and participation (DiCicco‐Bloom & Crabtree, 2006).

The researcher needs to be reflexive, as the social roles of the interviewer and participant will shape the process (DiCicco‐Bloom & Crabtree, 2006) with participants' responses influenced by the interviewer's tone of voice (Neuman, 2006), sex, age and ethnicity (Denscombe, 2010 and Cohen et al., 2007). Similarly, open-ended questions should be used, rather than leading questions, to avoid directing the interviewee's response (Seidman, 2006).

2.2.4.1 Transcription

There is no specific manner in which data should be transcribed, prior to thematic analysis, with the level of detail required less than that needed for methods such as discourse analysis (Braun & Clarke, 2006). There is no particular requirement for verbatim transcription (Halcomb & Davidson, 2006) and due to the manner in which participants speak, transcribers often have to make "judgement calls" (DiCicco‐Bloom & Crabtree, 2006). The process of transcription enables the researcher to become familiar with the data set at an early stage (Braun & Clarke, 2006).

2.2.4.2 Thematic analysis and data saturation

Different methods for analysing qualitative data exist, including narrative analysis, content analysis, grounded theory and thematic analysis (Spencer et al., 2014) with Braun & Clarke (2006) suggesting that thematic analysis is the first method that researchers should learn. Thematic analysis involves the identification of implicit and explicit themes contained within data Guest et al. (2012), allowing detailed descriptions to be given (Braun & Clarke, 2006). The grounded theory approach involves the development of a theory

grounded in the data (Braun & Clarke, 2006 citing McLeod, 2001), however, Braun & Clarke (2006) argue that use of the thematic analysis approach avoids the need to 'subscribe to the implicit theoretical commitments of grounded theory'. There are many ways in which to undertake thematic analysis, with Braun & Clarke (2006) outlining a six-phase process: data familiarisation, initial code generation, searching for themes, reviewing themes, defining and naming themes and report production.

The concept of data saturation relates to the point at which new data replicates that already obtained or has no relevance (Bowen, 2008). Achieving data saturation, during thematic analysis, helps provide validity, however research involving thematic analysis, rarely demonstrates that saturation was achieved (Ando et al., 2014) with Bowen (2008) commenting that there are "few, if any, definitive rules for determining saturation." An exploratory study, involving 33 interviews, reported that 12 interviews provided saturation (Ando et al., 2014), however the authors pointed out that different interview styles were a limitation to the work. A similar study, involving the thematic analysis of 60 in-depth interviews, also found saturation was achieved after the first 12 interviews (Guest et al., 2006). The relevance of the findings are weakened however by the authors' comment that 12 interviews may not always suffice, for example if assessing differences between distinct groups or if the research topic is diffuse.

2.3 Presentation of the research

The three strands of the research (longitudinal data analysis, questionnaires and interviews) will be considered separately initially, with methods, results and discussion presented for each strand in separate chapters. The three strands will then be considered as a whole, with areas of particular interest and relevance discussed, including the students who failed to progress.

2.4 Research questions

- What is the nature of student performance in end-of-year BDS examinations, as they progress from beginning to end of their programmes?
- What factors do BDS1 and BDS5 KCLDI students perceive to affect their progression through the dental programme?

2.5 Aims and objectives

The aim of the PhD was to investigate the progression of KCLDI undergraduates through their dental programmes and determine what factors influence their progression. The objectives were:

- To assess how KCLDI undergraduate students perform in end-of-year BDS examinations, relative to their peers, as they progress through their programme
- To assess how performance in end-of-year BDS examinations at the beginning of the programme related to performance in BDS examinations at the end of the programme
- To explore BDS1 students' perception of factors affecting their progression during the first year
- To explore BDS5 students' perception of factors affecting the progression of students during the undergraduate programmes

3 Chapter 3. Longitudinal data analysis

3.1 Methods

3.1.1 BDS programme at KCLDI

Students at KCLDI (King's College London Dental Institute) qualify from two main groups, those on a 5-year programme and those with an existing degree and who are enrolled on a 4-year pathway and called GPEP (Graduate/Professional Entry Pathway). Both groups share the same curriculum and summative assessments, apart from year one (BDS1), which does not involve the GPEP students.

In common with all teaching establishments, changes to the teaching methods and examination structure occur from time to time. This Chapter investigates student examination performance within the Institute and how they progress through their programmes, relative to their peers.

3.1.2 Recruitment/collection of data.

The end-of-year BDS examination performance data of students starting their undergraduate course in 2007 (graduating 2012; Cohort One, C1) and 2008 (graduating 2013; Cohort Two, C2) (Table 3) were collected from the Examinations Office and analysed. In addition, the GPEP students starting in 2008 and graduating in 2012 (Cohort 3, C3) and starting in 2009 and graduating in 2013 (Cohort 4, C4) were also collected. The data sheets containing the grades were prepared by the Examinations Office.

Assessment at KCLDI consists of summative and formative components. Formative assessments were provided at time points during the students' educational experience and were designed to provide students with feedback concerning their academic and clinical progress, but did not contribute to their end-of-year BDS examination score. These formative assessments took a variety of forms, including written and online examinations. They were often not subject to the same degree of academic scrutiny as the summative assessments, with for example written papers often single-marked. Anecdotal evidence also suggests students do not approach formative assessments in the same way as summative, with some undertaking little preparation for the former. For these reasons, formative assessments were not included in the longitudinal analyses, and will not be discussed further. The analyses comprised only summative assessments.

The 5-year groups (C1 and C2) were assessed at the end of their first, second, third, fourth and fifth years (these assessments are called BDS1, BDS2, BDS3, BDS4 and BDS5 respectively). The GPEP students in C3 and C4 were examined at the end of their first, second, third and fourth years correlating to BDS2, BDS3, BDS4 and BDS5 respectively. Each year, the C1 (5-year) and C3 (GPEP) groups sat identical BDS2, BDS3, BDS4 and BDS5 examinations, as did the C2 and C4. However, due to slight changes in the examination structure between years there were differences in the assessment of C1 compared to C2 and also of C3 compared to C4.

The summative assessments included spotter, written, online, objective structured clinical examination (OSCE), clinical reasoning examination (CRE), case presentation and in-course assessment (ICA). The in-course assessment involved a number of components, each worth a different percentage of the overall ICA mark. These components were taken at intervals during the academic year and their exact composition varied from year-group to year-group. Examples of the type of component included a timed essay, practical sessions and student-selected projects.

The spotter examination comprised a series of photographs and related questions, for example a picture of a dental instrument or material. Both the written and online examinations covered a range of dental disciplines, the online examination being a computer-based test and the written examination involving short answer or essay style questions. The online questions were mainly in the form of single best response (SBR) and extended matching questions (EMQ). SBRs involved candidates selecting the best answer to a single question, usually from a selection of five. An EMQ consisted of a scenario, with several related questions, all of which had 8 to 10 options as possible answers, with students having to select the most appropriate option as the correct answer.

The OSCE examinations comprised a number of stations, based on clinical topics, with the student spending an allocated period of time at one station before moving onto the next. In the clinical reasoning examination students were given written descriptions of clinical cases, with photographs and

radiographs. They had a set period of time immediately before each station to consider each of these scenarios, before being questioned by a couple of examiners. The case presentation involved the student undertaking an extensive course of treatment on a patient, usually during their final year. The student then presented his / her patient with a written summary to the examiners, who asked the student relevant questions concerning the case.

The summative assessments for C1 were written examinations and online examinations in each of the five BDS examinations (Table 4). There was an in-course assessment (ICA) component at BDS1, BDS2 and BDS3 examinations and a spotter examination in the BDS1 and BDS2 examinations.

Table 4. Summative examinations undertaken by C1 5yr students during each BDS year. Those marked X* were also undertaken by the C3 GPEP students.

Examination components	BDS1	BDS2	BDS3	BDS4	BDS5
In-course assessment	X	X*	X*		
Spotter	X	X*			
Written	X	X*	X*	X*	X*
Online	X	X*	X*	X*	X*
OSCE			X*	X*	X*
Clinical reasoning					X*
Case presentation					X*

The BDS3, BDS4 and BDS5 examinations all contained an OSCE and the BDS5 examination also contained clinical reasoning and case presentation components (Table 4).

The C2 group had a written examination and an online examination in all five of their BDS examinations. There was an in-course assessment component in their BDS1 and BDS2 examinations and a spotter examination in their BDS1 examination. The BDS3, BDS4 and BDS5 examinations all contained an OSCE and the BDS5 examination also contained clinical reasoning and case presentation components (Table 5).

Table 5. Summative examinations undertaken by C2 5yr students during each BDS year. Those marked X* were also undertaken by the C4 GPEP students.

Examination components	BDS1	BDS2	BDS3	BDS4	BDS5
In-course assessment	X	X*			
Spotter	X				
Written	X	X*	X*	X*	X*
Online	X	X*	X*	X*	X*
OSCE			X*	X*	X*
Clinical reasoning					X*
Case presentation					X*

The C3 group sat identical BDS2, BDS3, BDS4 and BDS5 examinations as C1. The C4 group sat identical BDS2, BDS3, BDS4 and BDS5 examinations as C2 (Table 4 and Table 5).

3.1.2.1 Exclusion criteria

Any students that did not complete the first sitting of any BDS examinations were excluded. For example, students whose studentship was terminated, were ill, or produced extenuating circumstances at the time of the examination were not included in the analyses. These students are discussed further in Chapter 6 of this thesis. This process ensured that as each of the four groups progressed through the programme, the number and identity of individuals in each group remained the same, enabling comparisons to be made.

3.1.2.2 Data gathering

The BDS examination results for the four groups (C1, C2, C3 and C4) were obtained from KCLDI's Examination Office. Each BDS examination comprised a range of components as detailed in Table 4 and Table 5 with the raw percentage score awarded to each student for each component part obtained.

3.1.3 Ethical approval

Permission to access the data for document analysis, was given by KCLDI's Director of Education and the Head of Health School Admissions and approval given by King's College Ethics Committee in September 2012 (reference BDM/11/12-117).

3.1.4 Analysis of data by investigator

An overall (final) BDS1 percentage score for each student in C1 and C2 was calculated, by adding the scores of the relevant individual assessment components. The component parts are shown in Table 4 and Table 5. An overall (final) percentage score for each student was similarly calculated for the BDS2, BDS3, BDS4, and BDS5 examinations. An identical process was carried out for the C3 and C4 BDS2, BDS3, BDS4 and BDS5 examinations.

3.1.4.1 Analysing student progression by ranking and categorisation into top and bottom halves

The overall (final) BDS1 percentage scores for each of the 5-year programme students (C1 and C2) were ranked from first to last place. This was repeated with the BDS2, BDS3, BDS4 and BDS5 overall (final) percentage scores. These ranked scores were then divided into top and bottom halves to facilitate analysis of student progression. If the number of students was divisible by two, these halves were of equal size. If the number was indivisible by two, the top ranking "half" was made the smaller of the two. If equally ranked students existed at the boundaries between the top and bottom halves, the online paper score acted as a "tie-breaker", with the student scoring higher on the online score being placed in the top half. If the online scores were also the same, then the student's written paper score was used.

The ranking and banding process described for the C1 and C2 groups was repeated for the C3 and C4 (GPEP) groups, using their calculated final

BDS2, BDS3, BDS4 and BDS5 percentage scores and individual component scores. The protocol for dealing with equally ranked students at the band boundaries, was identical to that described for C1 and C2.

An analysis of these halves was carried out and the proportion of C1 and C2 students remaining in the same half, as they progressed from BDS1 to BDS5, was calculated. Similarly, the proportion of C3 and C4 remaining in the same half as they progressed from BDS2 to BDS5 was calculated. This process of ranking and division into halves was repeated for ICA, the written paper, the online examination and the OSCE components of the individual BDS examinations. The clinical reasoning and case presentation components were not included in this analysis as they were only sat in BDS5. The spotter examination, similarly, was not analysed, as it was a component of only a small number of examinations (Table 4 and Table 5). If students achieved the same ranking in the ICA and OSCE components, the same protocol described above was used as the “tie-breaker”.

3.1.4.2 Analysing student progression by ranking and categorisation into top, middle and bottom thirds

The ranked overall (final) BDS1, BDS2, BDS3, BDS4 and BDS5 scores, described in Section 3.1.4.1, were then divided into thirds. The thirds comprised a top third (containing those students that ranked highest), a middle and bottom. If the number of ranked students was divisible by three, then the thirds were made of equal size. If the total number of students was

indivisible by three, a protocol was devised whereby the top and bottom thirds were made equal in size and the middle third smaller.

The “tie-breaker” protocol described above was used in an identical manner in cases where students had identical rankings at grade boundaries. The analyses described in Section 3.1.4.1 were then repeated, for both the overall (final) scores and the component examination parts. The steps involved in the analyses are summarised in Figure 2.

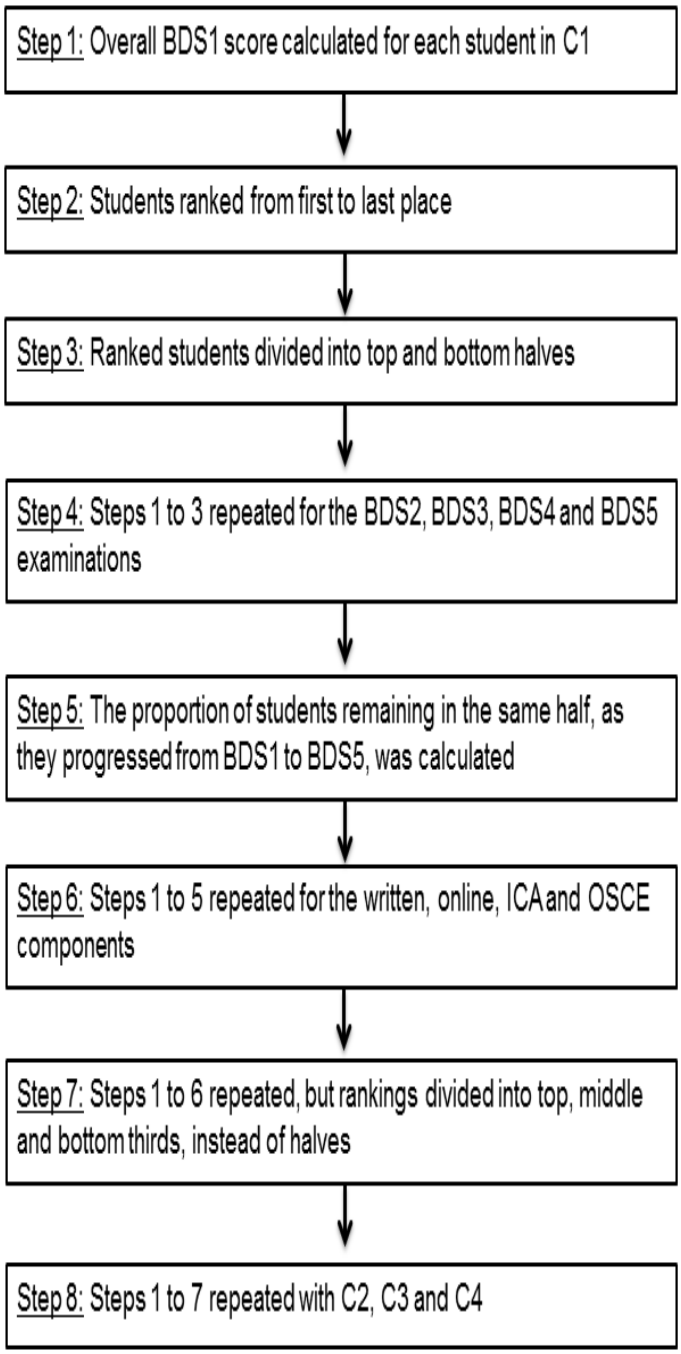

Figure 2. Summary of the steps involved in the longitudinal analysis

3.1.5 Analysing student progression by use of a general linear (random effects) model

A general linear (random effects) model was used, employing the data set described in Section 3.1.4. The data comprised students' percentage scores for the component parts of each end-of-year examination, for both the 5-year and GPEP programmes graduating in 2012 (C1 and C3 respectively) and 2013 (C2 and C4 respectively).

The 5-year programme and GPEP data for 2012 graduates (C1 and C3) were combined and similarly for 2013 graduates (C2 and C4), with the C1 and C3 data analysed separately from the C2 and C4 data. The component parts of each end-of-year examination (Table 4 and Table 5) were categorised as being either "academic" (spotter, written and online components) or "clinical" (OSCE, case-presentation and clinical-reasoning components). The in-course assessment was categorised as "academic" in all cases except for the BDS3 examination undertaken by C1 and C3. This examination was categorised as "written" for one analysis (calculation 1) and "clinical" for a second (calculation 2), due to uncertainty as to its exact composition.

The student gender, date of birth and ethnicity were obtained from the Academic Centre. As the sample size for each ethnicity was small, the students were categorised as "white" or "non-white" for analysis. A breakdown of the different ethnic groups is given in Appendix 10.2.2, Table 62. The data were analysed to explore whether gender, age or ethnicity were

related to student performance during the programme. The analysis was undertaken for both academic and clinical examinations, using STATA® (Version 12, StataCorp LP, TX, USA).

3.1.6 Analysing student progression by use of Pearson's correlation coefficients

Pearson's correlation coefficients were calculated using SPSS® (Version 20, IBM®, Armonk, New York). BDS1 final percentage marks were compared to BDS5 final percentage marks to establish whether performance at BDS1 was related to performance at BDS5. Comparisons were made between the component examination parts of the BDS1 examination and the BDS5 final mark to establish whether any of these components were related to BDS5 performance, and similarly between the BDS1 final mark and the various components of the BDS5 examination. Pearson's correlation coefficients were calculated for the C2 group in an identical manner to that described above for C1; similarly, coefficients were calculated for C3 and C4 (GPEPs), comparing BDS2 results with BDS5 results.

A coefficient below 0.36 was interpreted as being weak and above 0.67 strong (Taylor, 1990 citing Weber and Lamb, 1970 and Mason et al., 1983).

3.2 Results

3.2.1 Demographic information

The 5-year dental undergraduate programme starting in 2007 (Cohort 1, C1) consisted of 129 students, 75 females and 54 males, with an age range (in June 2008) of 18.7 to 35.7 years (median 19.4) (Table 6). 25 (19.4%) students identified themselves as being white, 99 (76.7%) as non-white and 5 (3.9%) refused the information. The 5-year programme starting in 2008 (Cohort 2, C2) contained 133 students, 79 females and 54 males, with an age range (in June 2009) of 18.4 to 32.5 years (median 19.4). 25 (18.8%) students identified themselves as being white, 103 (77.4%) as non-white and 5 (3.8%) refused the information (Table 6).

Table 6. Demographic information for the students entering the 5-year programmes in 2007 (C1) and 2008 (C2) and the GPEP pathways in 2008 (C3) and 2009 (C4). The percentage of the total number of students entering each programme is given in brackets for gender and ethnicity.

		C1	C2	C3	C4
Gender	Female n (%)	75 (58.1)	79 (59.4)	18 (60.0)	21 (63.6)
	Male n (%)	54 (41.9)	54 (40.6)	12 (40.0)	12 (36.4)
Ethnicity	White n (%)	25 (19.4)	25 (18.8)	14 (46.7)	16 (48.5)
	Non-white n (%)	99 (76.7)	103 (77.4)	13 (43.3)	17 (51.5)
	Unknown n (%)	5 (3.9)	5 (3.8)	3 (10.0)	0 (0.0)
Age (June after admission)	Mean (SD)	20.2 (2.8)	20.0 (2.1)	25.2 (3.0)	23.8 (3.2)
	Median (min, max)	19.4 (18.7, 35.7)	19.4 (18.4, 32.5)	24.9 (21.8, 31.5)	23.0 (21.9, 40.2)

The 4-year GPEP pathway starting in 2008 (Cohort 3, C3) had 30 students, 18 females and 12 males, with an age range (in June 2009) of 21.8 to 31.5

years (median 24.9). 14 (46.7%) students identified themselves as being white, 13 (43.3%) as non-white and 3 (10.0%) refused the information (Table 6). The GPEP cohort starting in 2009 (Cohort 4, C4) contained 33 students, 21 females and 12 males, with an age range (in June 2010) of 21.9 to 40.2 years (median 23.0). 16 (48.5%) students identified themselves as being white and 17 (51.5%) as non-white (Table 6).

3.2.2 Students excluded from the analyses

From those students commencing the 5-year programme in 2007 (C1), 18 were excluded from the analyses (Table 7), six males and 12 females.

Table 7. Numbers of students entering the C1, C2, C3 and C4 programmes, the number excluded and number analysed. The percentage of the total number entering each programme is given in brackets.

	C1 5-year	C2 5-year	C3 GPEP	C4 GPEP
Total number entering programme	129 (100.0)	133 (100.0)	30 (100.0)	33 (100.0)
Number who were excluded from analyses (%)	18 (14.0)	29 (21.8)	1 (3.3)	3 (9.1)
Total number analysed (%)	111 (86.1)	104 (78.2)	29 (96.7)	30 (90.9)

Of the remaining 111 students, 63 (56.8%) were female, 85 (76.6%) identified themselves as being of non-white ethnicity and the median age (in June of BDS1) was 19.4 years (age range: 18.7 – 33.6 years) (Table 8).

Table 8. Gender, ethnicity and age of the students analysed. The percentage of the total cohort analysed is given in brackets for gender and ethnicity.

		C1	C2	C3	C4
Gender	Female n (%)	63 (56.8)	63 (60.6)	17 (58.6)	19 (63.3)
	Male n (%)	48 (43.2)	41 (39.4)	12 (41.4)	11 (36.7)
Ethnicity	White n (%)	21 (18.9)	18 (17.3)	14 (48.3)	15 (50.0)
	Non-white n (%)	85 (76.6)	84 (80.8)	12 (41.4)	15 (50.0)
	Unknown n (%)	5 (4.5)	2 (1.9)	3 (10.3)	0 (0.0)
Age (June after admission)	Mean (SD)	20.1 (2.2)	19.9 (1.9)	25.3 (3.0)	24.0 (3.4)
	Median (min, max)	19.4 (18.7, 33.6)	19.4 (18.4, 29.9)	25.2 (21.8, 31.5)	23.1 (21.9, 40.2)

The reasons for the exclusions included five students who deferred their first sitting of one or more of their examinations due to mitigating circumstances, six students who re-sat the year, or took a year-out, two that intercalated and four whose studentship was terminated following failure in examinations (Table 9). This group of excluded students is considered in depth in Chapter 6.

From the 133 commencing the 5-year programme in 2008 (C2), 29 were excluded (Table 7), 13 males and 16 females. Of the remaining 104 students, 63 (60.6%) were female, 84 (80.8%) identified themselves as being of non-white ethnicity and the median age was 19.4 years (age range: 18.4 – 29.9 years) (Table 8).

The reason for the exclusions included 12 who re-sat the year, or took a year-out, six who withdrew from the programme, three whose studentship

was terminated following failure of examinations and five who took an intercalated degree (Table 9). This group of excluded students is again considered in depth in Chapter 6.

Table 9. Reasons for exclusion of students from the C1, C2, C3 and C4 programmes and numbers involved. The percentage of the total number entering each cohort is given in brackets.

Reason for exclusion	Number excluded (% of total number entering cohort)			
	C1	C2	C3	C4
Failure of examinations leading to termination of studentship	4 (3.1)	3 (2.3)		1 (3.0)
Failure to progress with peers; resitting one or more years or taking year-out	6 (4.7)	12 (9.0)		
Deferred first-sitting of an examination	5 (3.9)	3 (2.3)		1 (3.0)
Interrupted BDS programme to take an intercalated degree	2 (1.6)	5 (3.8)		
Withdrew from BDS programme	1 (0.8)	6 (4.5)		1 (3.0)
Unable to find relevant examination data			1 (3.3)	

From the 30 students commencing the GPEP pathway in 2008 (C3), one female student was not included (Table 7). Of the remaining 29 students, 17 (58.6%) were female, 12 (41.4%) identified themselves as being of non-white ethnicity and the median age (at June of BDS2) was 25.2 years (age range: 21.8 – 31.5 years) (Table 8). The reason for the non-inclusion was the student had changed her surname and subsequent investigation established she had progressed satisfactorily and graduated with her peers in 2012.

From the 33 commencing the GPEP pathway in 2009 (C4), three were excluded (Table 7), one male and two females. Of the remaining 30

students, 19 (63.3%) were female, 15 (50.0%) identified themselves as being of non-white ethnicity and the median age was 23.1 years (age range: 21.9 – 40.2 years) (Table 8). The reasons for the exclusions were termination of studentship, deferred first sitting of an examination and withdrawal of one individual from the programme (Table 9).

The 129 students entering the C1 pathway included five who were repeating the BDS1 year and of these, three were among those excluded from the analyses. The reason for exclusion of these three, was that the studentship was terminated for two, following examination failure, and the third case deferred an examination attempt. For the C2 pathway, two students were repeating the first-year. One of these two was among those excluded from the analyses, as they went on to take a year-out from study. There were no repeating students in C3 and C4. This group of repeating students is considered in depth in Chapter 6.

3.2.3 Analyses of student progression by ranking and categorisation into top and bottom halves

The C1 group comprised 55 students in the top half and 56 in the bottom "half" and the C2 group comprised 52 students in each half. The C3 (GPEP) group contained 14 students within the top "half" and 15 in the bottom. Finally the C4 (GPEP) group contained 15 students in each half.

3.2.3.1 Analysis of the student overall (final) scores, ranked and categorised into halves

The majority of the C1, C2 and C4 students moved between halves during progression through their programme, however the majority (51.7%, n = 15) of C3 (GPEP) students remained within one half (Figure 3). The analyses of the ranked final scores, for BDS1, BDS2, BDS3, BDS4 and BDS5, showed that approximately one fifth of C1 (21.6%, n = 24) and C2 (20.2%, n = 21) remained in the top half for all five examinations. A greater proportion of C3 (27.6%, n = 8) and smaller proportion of C4 (16.7%, n = 5) remained in the top half for all four of their examinations (BDS2, BDS3, BDS4 and BDS5). The analyses of the bottom halves revealed that 25 (22.5%) of C1 and 16 (15.4%) of C2 remained in the bottom half for all five examinations, whereas a greater proportion of C3 (24.1%, n = 7) and C4 (23.3%, n = 7) remained in the bottom half for all four of their examinations.

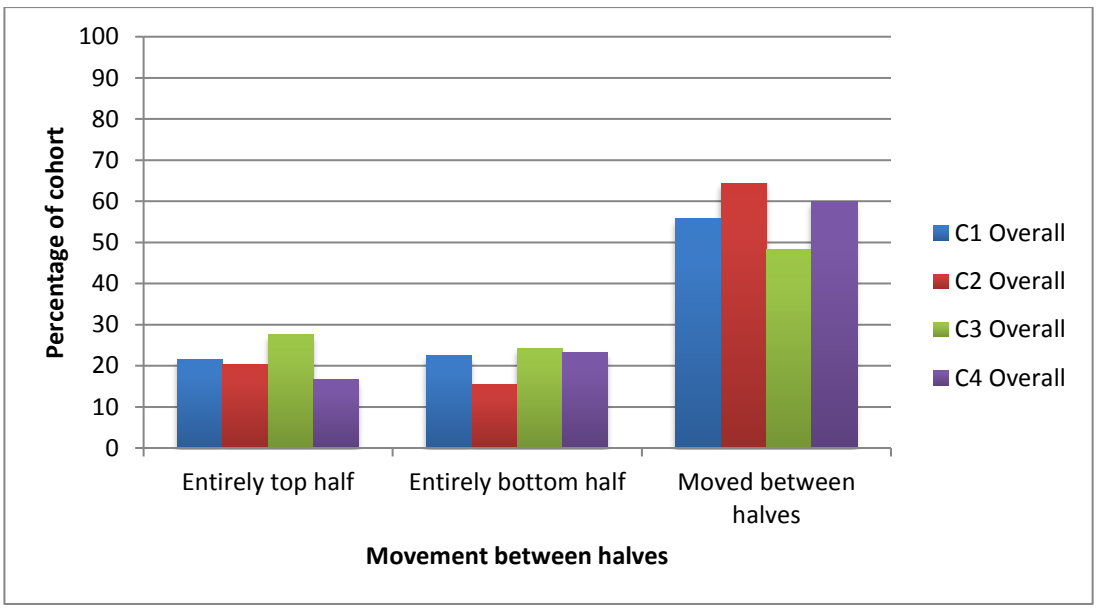

Figure 3. Proportion of students in C1, C2, C3 and C4 whose overall BDS score for each end-of-year examination, remained in the top half of their year-group, bottom half or moved between halves, during progression from beginning to end of their dental programmes. C1 and C3 graduated in 2012 and C2 and C4 in 2013.

3.2.3.2 Analysis of the student scores for the examination component parts, ranked and categorised into halves

The majority of the C1 (5-year) and C2 (5-year) students moved between halves in both the online and written examinations (Figure 4 and Figure 5). The majority of C3 (GPEP) and C4 (GPEP) also moved between halves in the written paper (Figure 5), though not in the online examination (Figure 4). For the online examination, approximately one fifth of C1 (20.7%, n = 23) and C2 (21.2%, n = 22) remained in the top half for all five online papers and a similar proportion remained in the bottom half for all five (18.0%, n = 20 for C1 and 22.1%, n = 23 for C2). For C3 and C4, seven (24.1%) and eight (26.7%) students respectively, remained in the top half for all four of their online papers and a similar proportion remained in the bottom half for all four.

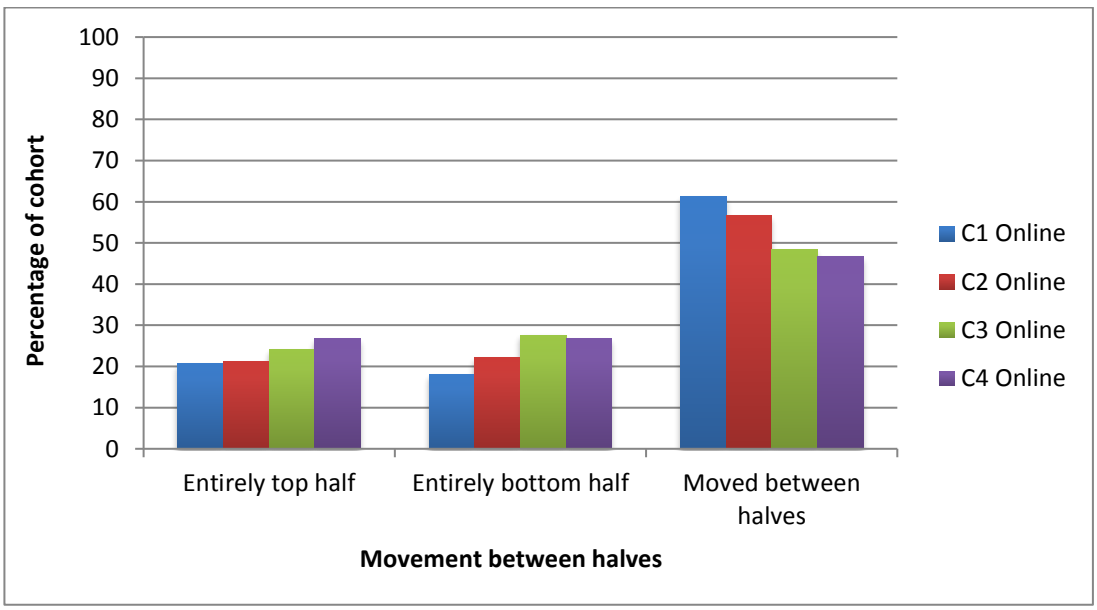

Figure 4. Proportion of students in C1, C2, C3 and C4 whose online score for each end-of-year examination, remained in the top half of their year-group, bottom half or moved between halves, during progression from beginning to end of their dental programmes. C1 and C3 graduated in 2012 and C2 and C4 in 2013.

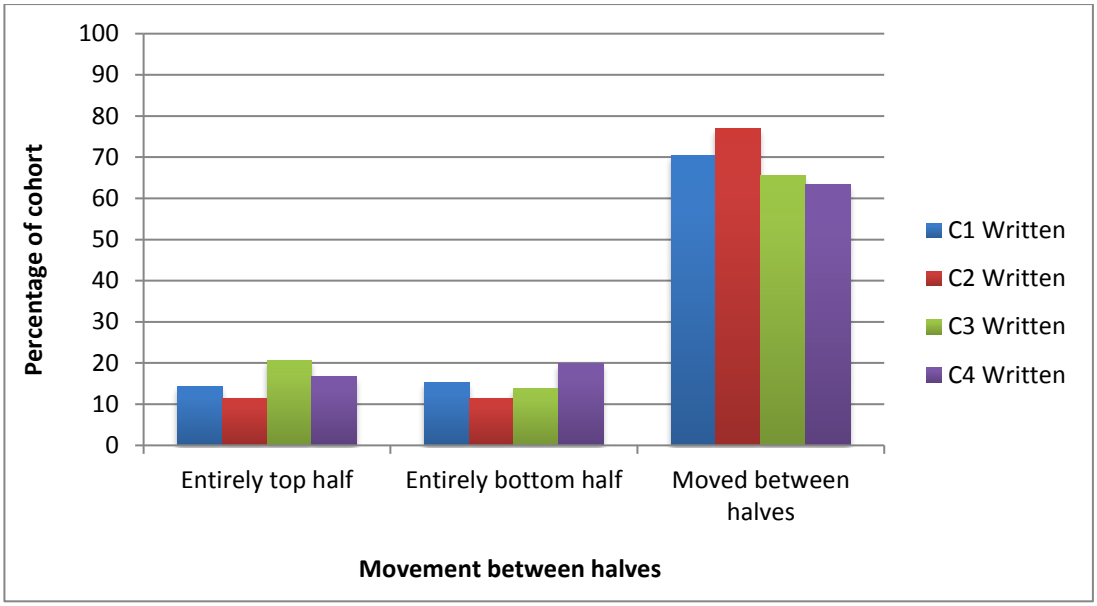

Figure 5. Proportion of students in C1, C2, C3 and C4 whose written score for each end-of-year examination, remained in the top half of their year-group, bottom half or moved between halves, during progression from beginning to end of their dental programmes. C1 and C3 graduated in 2012 and C2 and C4 in 2013.

For C1 14.4% (n = 16) remained in the top half and 15.3% (n = 17) in the bottom halves for all five written papers (Figure 5), and similarly for C2 (11.5%, n = 12 in both cases). For C3 and C4, six (20.7%) and five (16.7%) students respectively, remained in the top half for all four written papers and four (13.8%) and six (20.0%) respectively remained in the bottom half.

For the three OSCEs, the majority of C2 and C3 moved between halves (54.8%, n = 57 and 58.6%, n = 17 respectively). Conversely, 65 (58.6%) and 16 (53.3%) of C1 and C4 respectively, remained in the same half (Appendix 10.2.1, Figure 13). In the ICA, 74 (71.2%) of C2 remained in the same half for their two examinations and 19 (65.5%) of C3 and 51 (46.0%) of C1 did so in their three examinations (Appendix 10.2.1, Figure 14).

3.2.4 Analyses of student progression by ranking and categorisation into top, middle and bottom thirds

After division into thirds the C1 group comprised 37 students in each third, C2 group had 35 students in the top and bottom thirds and 34 in the middle third. The C3 group contained 10 students in the top and bottom third and nine in the middle third. Finally the C4 group contained ten students within each third. The result of the C1 and C3 ranking and division into thirds process is illustrated in Table 10 and Table 11 respectively.

Table 10. Ranking and division into thirds of the C1 (5-year programme, 2012 graduation) students for the BDS1, BDS2, BDS3, BDS4 and BDS5 examinations. Each row represents the same student as he/she moves through the programme. The green cells indicate those students ranked in the top third, orange cells indicate the middle third and red the bottom third.

Student Identifier	C1 BDS1 2008	C1 BDS2 2009	C1 BDS3 2010	C1 BDS4 2011	C1 BDS5 2012
1					
37					
44					
60					
61					
65					
91					
107					
110					
121					
123					
68					
69					
13					
19					
31					
95					
22					
53					
3					
88					
6					
18					
50					
4					
5					
8					
114					
14					
129					
39					
51					
7					
96					
94					
76					
99					
49					
81					
73					
34					
128					
84					
15					
77					
52					
12					
78					
75					
71					
35					
56					
16					
102					
42					
79					
28					
33					
126					
97					
111					
57					
48					
17					
106					
124					
20					
26					
38					
108					
59					
55					
9					
11					
41					
80					
43					
119					
118					
127					
125					
98					
105					
120					
63					
89					
83					
86					
23					
27					
67					
100					
122					
115					
47					
82					
36					
113					
109					
74					
90					
46					
64					
72					
87					
92					
93					
101					
103					
116					
117					

Table 11. Ranking and division into thirds of the C3 (2012 graduation) GPEP students for the BDS2, BDS3, BDS4 and BDS5 examinations. Each row represents the same student (identified in the first column). The number in each cell represents the student's ranking within their cohort (from 1st to 29th) for each of the BDS examinations. The green cells indicate those students ranked in the top third, orange cells indicate the middle third and red the bottom third.

Student Identifier	C3 GPEP Rank BDS2 2009	C3 GPEP Rank BDS3 2010	C3 GPEP Rank BDS4 2011	C3 GPEP Rank BDS5 2012
130	2	1	1	1
135	6	9	8	5
136	7	10	6	11
137	8	6	8	15
131	1	4	6	13
134	5	3	4	13
133	4	2	11	2
132	3	11	5	7
139	10	17	12	12
138	9	16	21	25
143	14	12	18	15
144	16	19	13	19
141	12	5	2	4
147	18	15	3	3
142	13	7	18	20
145	17	8	16	27
146	15	13	8	20
150	19	23	13	22
140	11	24	25	24
148	21	14	13	10
151	22	18	16	17
149	20	20	22	5
158	28	25	20	9
156	26	22	26	8
155	23	21	23	18
157	27	28	28	25
153	25	27	27	28
154	24	26	24	23
159	29	29	29	29

3.2.4.1 Analysis of the student overall (final) scores, ranked and categorised into top, middle and bottom thirds

The majority of the students moved between thirds (Figure 6). The analyses of the ranked overall (final) scores, for BDS1, BDS2, BDS3, BDS4 and BDS5, observed that 11 (9.9%) students in C1 (5-year) and 11 (10.6%) in C2 (5-year) remained in the top third for all five examinations. A similar proportion of C3 GPEP (6.9%, n = 2) and C4 GPEP (10.0%, n = 3) students remained in the top third for all four of their examinations (BDS2, BDS3, BDS4 and BDS5). Fewer than 10.0% of C1 and C2 students remained in the bottom third for all five examinations (9.0%, n = 10 and 5.8%, n = 6 respectively), whereas four (13.8%) of C3 and five (16.7%) of C4 remained in the bottom third for all four of their examinations.

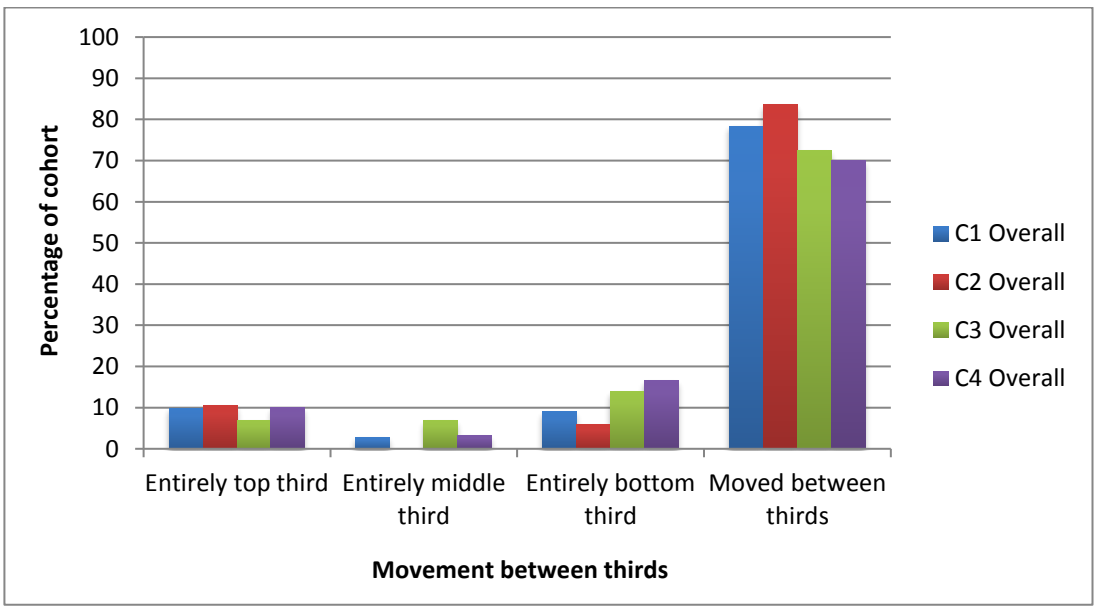

Figure 6. Proportion of students in C1, C2, C3 and C4 whose final (overall) BDS score for each end-of-year examination, remained in the top third of their year-group, middle third, bottom third or moved between thirds, during progression from beginning to end of their dental programmes. C1 and C3 graduated in 2012 and C2 and C4 in 2013.

Of the 37 C1 students who were ranked in the middle third at BDS1 (Table 10) the average change in rank, when comparing BDS1 to BDS5, was 32 places (range of change in rank: 0 to 59) and for C2 the average was 24 rank changes (range of change in rank: 1 to 58). For the nine C3 GPEPS who were ranked in the middle third at BDS2, there was a mean rank change of 7 (range of change in rank: 1 to 15) and the C4 mean was 8 (range of change in rank: 1 to 15).

3.2.4.2 Analysis of the student scores for the examination component parts, ranked and categorised into top, middle and bottom thirds

The majority of the students moved between each third for the online component, during progression through their programme (Figure 7). For C1, 10 (9.0%) students remained in the top third for all five online papers, one (0.9%) in the middle third and 11 (9.9%) in the bottom third. A similar proportion of the C2 students remained in the top, middle and bottom thirds (11.5%, n = 12, 2.9%, n = 3 and 10.6%, n = 11 respectively). For C3, four (13.8%) students remained in the top and three (10.4%) in the bottom third, which was similar to C4 where three (10.0%) students remained in both top and bottom thirds. No students remained in the middle third for either the C3 or C4 groups.

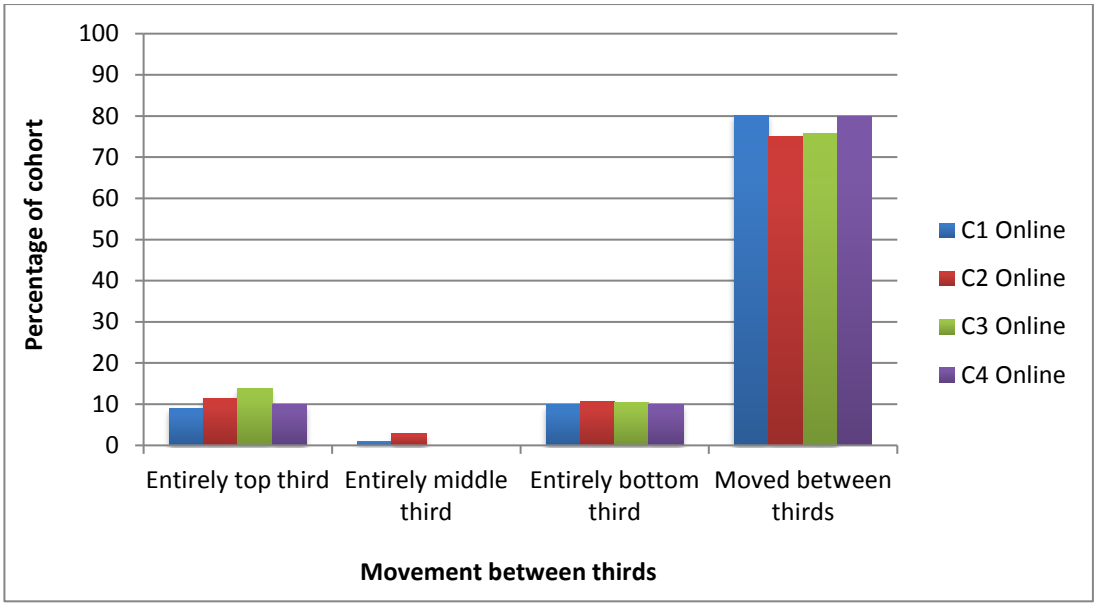

Figure 7. Proportion of students in C1, C2, C3 and C4 whose online score for each end-of-year examination, remained in the top third of their year-group, middle third, bottom third or moved between thirds, during progression from beginning to end of their dental programmes. C1 and C3 graduated in 2012 and C2 and C4 in 2013.

Most students also moved between the thirds, in the written examinations, as they progressed through their programme (Figure 8). The analyses showed that seven (6.3%) students in C1 remained in the top third for all five written papers, one (0.9%) in the middle third and six (5.4%) in the bottom third. For the C2 students, five (4.8%) remained in the top third, two (1.9%) in the middle third and three (2.9%) in the bottom third. The analyses of the C3 group observed four (13.8%) students remained in the top third for all four written papers and two (6.9%) in the bottom third. For the C4 group, no students stayed in the top third, though two (6.7%) remained in the bottom third. No students remained in the middle third for either the C3 or C4 groups.

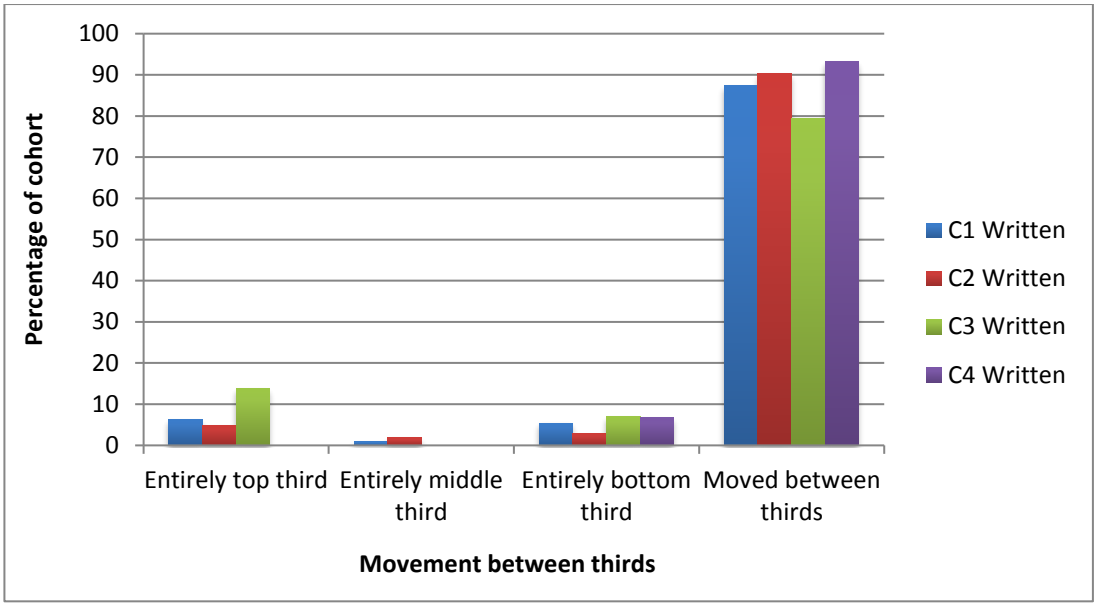

Figure 8. Proportion of students in C1, C2, C3 and C4 whose written examination score for each end-of-year examination, remained in the top third of their year-group, middle third, bottom third or moved between thirds, during progression from beginning to end of their dental programmes. C1 and C3 graduated in 2012 and C2 and C4 in 2013.

Like the other examinations, students moved between the thirds in the OSCEs and ICAs, during progression through their programme (Appendix 10.2.1, Figure 15 and Figure 16). For C1 OSCE, 14 (12.6%) remained in the top third, three (2.7%) in the middle third and 13 (11.7%) in the bottom third for all three OSCE papers. A similar distribution was observed for all the other groups. The majority of C1 (78.4%, n = 87) moved between thirds for the ICA examinations, though the majority of C2 (57.7%, n = 60) and C3 (55.2%, n = 16) remained within the same third.

3.2.5 Analyses of student progression by use of a general linear (random effects) model

3.2.5.1 General linear (random effects) model analysis for the students who graduated in 2012 (C1 and C3 combined)

The analysis of academic performance (with in-course assessment included as a component part of BDS3) for the 5-year and GPEP students graduating in 2012 (C1 and C3 respectively) showed the effect of non-white ethnicity, compared to white ethnicity was -1.89 (p = 0.001). White students performed better than non-white during their programme. Gender and age were not significant predictors of performance (Table 12).

Table 12. Academic performance using a general linear (random effects) model for 5-year and GPEP programmes graduating in 2012. With in-course assessment included as a component part of BDS3 (calculation 1).

Predictor	Effect	p value	95% confidence intervals	
			LCL	UCL
Male gender	-0.27	0.56	-1.17	0.63
Non-white ethnicity	-1.89	0.001	-2.95	-0.82
Age	-0.04	0.67	-0.22	0.14

The analysis of academic performance, with in-course assessment excluded as a component part, observed very similar results (Appendix 10.2.2. Table 64). White students performed better than non-white (effect -1.84, p = 0.001).

The analysis of clinical performance (with in-course assessment both included and excluded as a component part of BDS3) observed gender, ethnicity and age were not significant predictors of performance (Appendix 10.2.2. Table 65 and Table 66).

3.2.5.2 General linear (random effects) model analysis for the students who graduated in 2013 (C2 and C4 combined)

The analysis of academic performance for the 5-year and GPEP students graduating in 2013 (C2 and C4 respectively) showed the effect of age was statistically significant (-0.21, p = 0.02). Younger students performed better than older students. Ethnicity and gender were not significant predictors of performance (Table 13).

Table 13. Academic performance using a general linear (random effects) model for 5-year and GPEP programmes graduating in 2013.

Predictor	Effect	p value	95% confidence intervals	
			LCL	UCL
Male gender	-0.82	0.05	-1.66	0.01
Non-white ethnicity	-0.21	0.69	-1.22	0.81
Age	-0.21	0.02	-0.38	-0.03

The analysis of clinical performance showed the effect of gender (-1.72, p = 0.01) and age (-0.45, p < 0.001) were statistically significant. Female students performed better than males and younger students better than older. Ethnicity was not a significant predictor of performance.

Table 14. Clinical performance using a general linear (random effects) model for 5-year and GPEP programmes graduating in 2013.

Predictor	Effect	p value	95% confidence intervals	
			LCL	UCL
Male gender	-1.72	0.01	-2.95	-0.48
Non-white ethnicity	-1.24	0.10	-2.72	0.23
Age	-0.45	<0.001	-0.70	-0.20

3.2.6 Analyses of student progression by use of Pearson's correlation coefficients

3.2.6.1 C1 and C2 (5-year groups)

A moderate, positive statistically significant correlation was observed between C1 BDS1 and BDS5 overall (final) marks ($r = 0.42$, $p < 0.05$), and also between the online ($r = 0.37$, $p < 0.05$) and written ($r = 0.42$, $p < 0.05$) component parts of the C1 BDS1 examination and BDS5 overall (final) mark (Table 15). A moderate, positive, statistically significant, correlation was also seen between the C1 BDS1 overall score and the BDS5 online ($r = 0.63$, $p < 0.05$) component, as well as all the C1 BDS1 component parts and the BDS5 online component ($r = 0.57$ (ICA), 0.53 (spotter), 0.55 (online), 0.53 (written), $p < 0.05$). There was no significant correlation between the BDS1 overall score and the BDS5 case presentation component ($r = 0.004$).

For C2 similar results were observed to C1, however unlike C1 weak, significant positive, correlations were observed between the BDS1 overall score ($r = 0.33$, $p < 0.05$), BDS1 online ($r = 0.28$, $p < 0.05$) and the BDS5 overall mark (Table 16). Unlike C1, a weak positive correlation was observed between the BDS1 spotter and the BDS5 online ($r = 0.22$, $p < 0.05$).

Table 15. Pearson's correlation coefficients for BDS1 examination results and BDS5 examination results, for C1 (2012 graduation, 5-year programme). *Correlation is significant at the 0.05 level (2-tailed).

	BDS5 C1 Written Paper	BDS5 C1 Online Paper	BDS5 C1 OSCE	BDS5 C1 Clinical Reason.	BDS5 C1 Case Present.	BDS5 C1 Overall Mark
BDS1 C1 (ICA)	0.18	0.57*	0.28*	0.26*	-0.02	0.35*
BDS1 C1 (Spotter)	0.19*	0.53*	0.19*	0.29*	0.001	0.33*
BDS1 C1 (Online)	0.20*	0.55*	0.27*	0.31*	-0.001	0.37*
BDS1 C1 (Written)	0.30*	0.53*	0.29*	0.34*	0.05	0.42*
BDS1 C1 Overall	0.25*	0.63*	0.31*	0.34*	0.004	0.42*

Table 16. Pearson's correlation coefficients for BDS1 examination results and BDS5 examination results for C2 (2013 graduation, 5-year programme). *Correlation is significant at the 0.05 level (2-tailed).

	BDS5 C2 Written Paper	BDS5 C2 Online Paper	BDS5 C2 OSCE	BDS5 C2 Clinical Reason.	BDS5 C2 Case Present.	BDS5 C2 Overall Mark
BDS1 C2 (ICA)	0.31*	0.42*	0.15	0.22*	0.05	0.33*
BDS1 C2 (Spotter)	0.17	0.22*	0.03	-0.02	-0.03	0.09
BDS1 C2 (Online)	0.20*	0.45*	0.16	0.20*	-0.02	0.28*
BDS1 C2 (Written)	0.30*	0.45*	0.26*	0.31*	0.11	0.43*
BDS1 C2 Overall	0.29*	0.46*	0.18	0.21*	0.03	0.33*

3.2.6.2 C3 and C4 (GPEP groups)

A moderate, positive, statistically significant correlation was observed between the C3 BDS2 and BDS5 overall scores (r = 0.55, p <0.05), and also between the BDS5 overall score and the ICA (r = 0.62, p <0.05), spotter (r = 0.39, p <0.05) and written (r = 0.40, p <0.05) component parts of the BDS2 examination. A moderate, positive, statistically significant correlation was also observed between BDS2 overall score and the BDS5 online (r = 0.56, p <0.05), OSCE (r = 0.57, p <0.05) and clinical reasoning sections (r = 0.44, p <0.05). A moderate, positive statistically significant correlation was observed between all the C3 BDS2 component parts and the BDS5 online component (r = 0.46 (ICA), 0.46 (spotter), 0.56 (online), p <0.05), with the exception of the BDS2 written exam (r = 0.33). No statistically significant correlation was observed between the BDS2 overall score and the BDS5 case presentation component (r = -0.01). (Table 17).

Table 17. Pearson's correlation coefficients for BDS2 examination results and BDS5 examination results for C3 (2012 graduation, GPEP pathway). *Correlation is significant at the 0.05 level (2-tailed).

	BDS5 C3 Written Paper	BDS5 C3 Online Paper	BDS5 C3 OSCE	BDS5 C3 Clinical Reason.	BDS5 C3 Case Present.	BDS5 C3 Overall Mark
BDS2 C3 (ICA)	0.36	0.46*	0.66*	0.59*	-0.01	0.62*
BDS2 C3 (Spotter)	0.14	0.46*	0.38*	0.28	0.02	0.39*
BDS2 C3 (Online)	0.10	0.56*	0.36	0.21	-0.10	0.33
BDS2 C3 (Written)	0.13	0.33	0.38*	0.29	0.13	0.40*
BDS2 C3 Overall	0.24	0.56*	0.57*	0.44*	-0.01	0.55*

For C4, similar results were observed to C3, though a moderate, positive statistically significant correlation also existed between the C4 BDS2 overall mark and the BDS5 written examination ($p < 0.05$, $r = 0.48$). Unlike C3, a weak, non-significant correlation was observed between the C4 BDS2 ICA and the BDS5 online ($r = 0.30$) (Table 18).

Table 18. Pearson's correlation coefficients for BDS2 examination results and BDS5 examination results for C4 (2013 graduation, GPEP pathway). *Correlation is significant at the 0.05 level (2-tailed).

	BDS5 C4 Written Paper	BDS5 C4 Online Paper	BDS5 C4 OSCE	BDS5 C4 Clinical Reason.	BDS5 C4 Case Present.	BDS5 C4 Overall Mark
BDS2 C4 (ICA)	0.43*	0.30	0.26	0.05	0.34	0.37*
BDS2 C4 (Online)	0.29	0.49*	0.16	0.30	0.01	0.35
BDS2 C4 (Written)	0.35	0.35	0.43*	0.33	0.28	0.48*
BDS2 C4 Overall	0.48*	0.52*	0.38*	0.33	0.25	0.54*

3.3 Discussion

3.3.1 Outline of main findings

The progression of four cohorts of students were analysed using three separate analyses. The first involved the division of ranked examination scores into halves and thirds with the movement between halves / thirds studied. The overall findings were that a relatively small proportion of students remained in the top or bottom of their cohort throughout the programme, with the majority fluctuating.

The second analysis employed the same data set and used a general linear (random effects) model. The overall findings were that gender did not predict academic performance and ethnicity did not predict clinical performance.

The third analysis used Pearson's correlation coefficients to investigate correlations between performance at the beginning and end of the programmes. The overall findings were that weak to moderately strong correlations were observed between overall performance in BDS1 (5-year pathway) and BDS2 (GPEPs) and overall performance in BDS5. Most of the variance in end-of-year examination performance was unaccounted for.

3.3.2 Discussion of method

In studying progression of undergraduate dental students there is a choice between focussing on academic progression, clinical progression or both. It was decided to focus primarily on academic progression, as the data were available from the Examination Office, in the form of the end-of-year BDS

results. Assessment of clinical progression, although as important as academic, and possibly more so in a practical subject like Dentistry, is reliant upon professional judgement and is thus more subjective and challenging to compare between years and courses.

During the students' educational programme there were a range of clinical examinations undertaken, both on "phantom heads" and on patients. These tended to be formative, assessments and were not included in the analyses. Some of these clinical examinations were single-marked and prone to possible inter-rater variability in the marking process and the nature of these clinical examinations were so diverse, that comparison of performance between students became too difficult. Baartman et al. (2013) also recognised the assessment of clinical ability to be problematic and for these reasons the decision was taken not to include these clinical assessments.

There was, however, a clinical element to some of the end-of-year examinations, for example, the OSCE and clinical reasoning components, although these did not involve treatment of patients. Some OSCE stations involved role-play exercises with actors, though there were only a few such stations. The case presentation examination in BDS5 involved presenting a patient that had undergone a course of treatment with the student, though no practical examinations involving patient treatment took place in the end-of-year examinations. It was decided to investigate student performance in these clinical components as well as assessments of an entirely academic nature, by use of a general linear (random effects) model, to determine

whether the predictors of performance differed between the two (Section 3.1.5).

Van der Vleuten & Schuwirth (2005) reported that multiple assessment methods were desirable, allowing triangulation of results and at KCLDI there were a range of assessments undertaken during the BDS programme. The end-of-year summative examination process was thorough, with examination questions and, where relevant, detailed marking guides, approved by a committee of examiners, both internal and external to KCLDI. The marking of students' answer papers and results were subjected to a similar thorough process and met the approval of internal and external examiners. The written examinations, for example, were blind double-marked and the online examination papers marked by a computer.

The 5-year pathway starting in 2007 (C1) was analysed separately from the one starting in 2008 (C2) partly as the format of the examinations differed, but also to investigate whether trends occurred over more than one year. On the whole, the outcome from both year-groups were similar. The graduate entry cohorts, C3 and C4, were analysed separately from the 5-year cohorts as their pathways differed.

As each of the four groups, C1, C2, C3 and C4, progressed through their programme, there were fluctuations in the group size. For example, some individuals had their studentship terminated, others were required to resit a year or some students interrupted the BDS programme to intercalate another

degree, as shown in Table 9 and discussed in Chapter 6. A decision was made to consider these students separately because making a direct comparison between their results was not possible. The numbers eliminated from C1 and C3 were lower than C2 and C4 respectively. It is not possible to assess why these differences occurred or whether this pattern resulted from changes to the examinations or to individual experiences. The variation was considerable, with 18 students (14%) excluded from C1 and 29 (22%) from C2 and 1 student (3%) excluded from C3 and 3 (9%) from C4.

The removed students included several who were of particular interest as they struggled or failed to progress through the programme. Of the 325 students entering the C1, C2, C3, C4 pathways, 51 were removed from the analyses, including 16 resitting a year and 12 who had their studentship terminated. A difference was observed between the 5-year programmes and the GPEP, with five members of C1 and 10 of C2 resitting and none from the GPEP groups. A possible reason for this difference was that GPEP students were more highly motivated to succeed (Wilkinson et al., 2004), and had more experience of university study and examination processes (Newton et al., 2011), having already undertaken one degree. The observed differences between the 5-year and GPEP groups demonstrated the relevance of the research, as much existing dental student performance and progression literature originates from the USA, where dental students are all graduate-entry. The need to study students in the UK context, where most enter dental school straight from school, is thus evident.

The removal of these individuals from the data analyses reinforced the relevance and importance of employing a mixed-methods approach. Several of the students eliminated from the C2 and C4 groups completed the questionnaire and provided valuable feedback, for example, factors that influenced their ability to study effectively. Some of these individuals contributed to the qualitative data, either through the focus groups or one-to-one interviews. These interviews enabled detailed questioning concerning factors that influenced student progression. The removed students are discussed in detail in Chapter 6.

The size of the 5-year pathway groups, each containing in excess of 100 students, was so large that to follow all the students through their programme on an individual basis would have made analyses too difficult. It was decided to rank the students initially into halves and then thirds, enabling simple analyses. The ranks do not necessarily relate to differences in grade attainments (such as pass, merit, distinction), with change in rank not necessarily equating to a change in grade. Whilst the ranking of students enabled top and bottom students to be identified, there was a lack of a fixed reference in relation to grade attainments such that students could have differing ranks but lie within the same grade category or vice-versa – this constrained generalisations about the nature of progression in the cohorts. Further subdivision, for example into quarters and fifths, was considered, however this would have been more labour-intensive, yielded smaller numbers of students within each subdivision and is unlikely to have added further insight into progression.

The “tie-break” protocol worked well for all the analyses, with no instances where ranking proved impossible. The individual component examinations proved to be the most complex to rank, due to the occurrence of several tied scores. The BDS3 C1 written paper, for example, comprised of 13 students each ranked 53rd, which was at the junction of the top and bottom half. Similarly the BDS4 C1 written paper also had 13 students with the same ranking between the top and middle thirds.

In order to minimise the impact of not employing fixed grade references, the individual examination components, for example the online assessments, were also ranked and analysed in addition to the overall (final) score. This allowed a systematic comparison to be made between components to establish whether any patterns in progression existed, with contradictory findings indicating the possible need for further investigation. Schuwirth & van der Vleuten (2004) explained that each examination format has advantages and disadvantages, with Brown (2010) for example reporting low agreement between markers of essay examinations. Analysis of the components thus gave the opportunity to establish whether such advantages and disadvantages, associated with any one component, had the potential to affect progression.

During the analysis of examination data, described in Section 3.1.4, it became apparent the data were clustered, with many students having similar or identical examination scores. A random effects model allows analysis of such clustered data (Petrie & Sabin, 2009). Having established the manner

in which students progressed from beginning to end of their programmes, the general linear (random effects) analysis was undertaken to determine whether gender, ethnicity or age predicted students' performance as they progressed.

The literature review established a wide range of outcome measures have been used to investigate student performance, with most being of an academic nature. Clinical performance is also of fundamental importance to the successful progression of a dental student, with some of the end-of-year examinations having a clinical emphasis, as discussed above. The random effects model thus considered student performance in the end-of-year academic and clinical assessments separately, to determine whether the predictors of performance differed between the two. It was unclear, following scrutiny of examination marking guides, whether the BDS3 in-course assessment (ICA), undertaken by Cohorts 1 and 2, was primarily of an academic or clinical nature. The data were thus analysed twice, the first calculation treated this ICA as an academic assessment and the second as a clinical one.

The analyses involved combining C1 and C3 data together (5-year and GPEP programmes graduating in 2012) and C2 and C4 together (5-year and GPEP programmes graduating in 2013). The rationale was C1 and C3 undertook identical examinations, as did C2 and C4, and combining the two cohorts provided a data set of sufficient size to analyse. Similarly the cohorts comprised 14 different ethnic groupings (Appendix 10.2.2, Table 62).

Condensing these into “white” and “non-white” provided data sets of sufficient size for analysis.

3.3.3 Discussion of results

3.3.3.1 Analyses of data following the ranking and division into halves and thirds

The aim was to assess how students performed in their end-of-year examinations, relative to their peers, as they progressed through their programme. The division into thirds resulted in a greater proportion of students moving between thirds than was observed between halves and enabled a better estimate, albeit crude, of how many students were high- or low-attaining candidates. The large number moving between thirds was unsurprising, as some individuals’ rankings fluctuated markedly from year to year with more movement thus expected between thirds, as one third of a cohort contained fewer students than one half. An advantage of the division into thirds, compared to division into halves, became apparent during the tie-break procedure described in Section 3.1.4.1, used for students who had equal ranks at the boundary between top/bottom halves or top/middle/bottom thirds. With the division into halves such students were placed into one of two categories, top or bottom, however the thirds analyses offered finer differentiation between student performance and some indication of the proportion of candidates changing rank across the programme. For these reasons, it was decided that the analysis of thirds yielded more information to help answer the research questions than the analysis of halves and conclusions were thus drawn from the thirds analyses.

The fluctuation in individual student rankings between start and end of programme, for those starting in the middle third of their cohort and moving either up or down in rank, became very evident. An average rank change of 32 places was seen, for the 37 students ranked in the middle third at the start of the C1 programme. Interpretation of large rank changes is difficult as students are being compared to peers, rather than a fixed reference point of grade/clinical practice/competence, so individuals may be performing poorly compared to peers though still satisfactorily in regards to programme requirements. The trend for much movement between ranks, does however possibly lend support for the constructivist models of learning, where students actively make sense of new knowledge with performance going up and down as a result, as opposed to the traditional linear model whereby learning is sequential (Gipps, 2012). Similarly, the pathway from novice to competent to expert is not linear (Chambers et al., 1996).

The movement in ranked places by students in the individual assessments was also considerable, with large proportions moving between thirds. Each examination format has advantages and disadvantages (Schuwirth & van der Vleuten, 2004) and the movement in ranked places seen in this work supports the suggestion of Schuwirth & van der Vleuten (2004) and Manogue et al. (2011) that multiple methods should be used. However, Chambers (1998) explained that greater levels of knowledge do not necessarily indicate higher levels of learning, with competent or proficient individuals often out-performing experts on tests of knowledge. It is often assumed that knowledge acquisition precedes clinical skills performance,

however the two should be considered simultaneously (Chambers, 1998 and Higgs et al., 2001). This is an area of future work, to review KCLDI assessments and ensure that design of clinical and knowledge-based assessments are consistent with an appropriate theoretical framework. A model of student progression from start to end of the programmes can then be developed and used to help demonstrate, at the point of graduation, that competence has been attained.

Attempts to further divide the ranked students into quarters proved too complex and would have resulted in very low numbers of students remaining within the same quartile throughout their programme, thus limiting the ability to draw meaningful and generalisable conclusions.

The greater proportion of students remaining within the same half or third, observed in the C2 (5-year) and C3 (GPEP) ICA, compared to the other examinations, was not surprising. Only two ICAs (in the case of C3) and three ICAs (for C2) were completed by students, as opposed to four or five examinations in the case of the overall scores, online and written components. The OSCE analyses similarly involved just three examinations and may explain the increased consistency of performance observed for division into halves in the C1 and C4 groups. For this reason conclusions were not made involving comparisons between the OSCE / ICA and the other analyses. The GPEP groups undertook just four end-of-year examinations, compared to the 5-year students who undertook five. It is probable that this factor contributed to the lower proportion of students

moving between halves and thirds observed for many of the C3 and C4 analyses.

3.3.3.2 Random effects model

Ethnicity was a significant predictor of academic performance, for students graduating in 2012, with white students performing better than non-white. This was the case irrespective of whether the BDS3 ICA was classified as an academic assessment or as a clinical assessment. This result was in agreement with research on medical students (Woolf et al., 2011 and McManus et al., 2013b), though a different result was seen with the students graduating in 2013, where age was the only significant predictor, with younger students performing better than older ones. This was in agreement with Adam et al. (2015) who reported younger medical students generally performed better than older students, in a range of academic assessments. Gender was not observed to be a significant predictor for either cohort. This was unsurprising as conflicting results were reported in the literature, with female dental students academically outperforming males in some studies (Ariyasinghe & Pallegama, 2013, Kim & Lee, 2007 and Mercer et al., 2013) and males outperforming females in others (Fields et al., 2003).

The explanation for different results between the two data sets (2012 and 2013 graduates) is unclear. Comparison of the demographic data showed little difference between students in the two groups with regards to age, gender or ethnicity (Appendix 10.2.2, Table 63). The cohorts graduating in 2012 (C1 and C3) comprised 57.1% females (61.2% in 2013) 25.0% white

ethnicity (24.6% in 2013) and had a median age on graduation of 23.6 years (range 22.7 – 37.6 years) compared to a median age on graduation of 23.7 years (range 22.4 – 43.2 years) in 2013. A possible explanation may be related to variation in the assessment process for the two groups, including factors such as the question design, reliability of markers and nature of standard setting. Brown (2010) for example, reported low agreement between markers of written essay questions, Norcini et al. (2011) explained the evidence base, related to standard setting and score aggregation for written examinations, requires further development and van der Vleuten (2000) suggested significant errors were made in performance assessment at final examinations.

These results demonstrate the difficulties inherent with researching this area and reinforces the earlier discussion, outlining the importance of using multiple methods of academic assessment in determining students' knowledge and understanding, as recommended by ADEE (Manogue et al., 2011).

No significant predictors of clinical performance were observed for the students graduating in 2012. The 2013 analysis observed younger students performed significantly better than older students, in agreement with the observations of medical students made by Adam et al. (2015). Females performed better than males in the clinical assessments, in agreement with research conducted on medical students by Ferguson et al. (2002) and Adam et al. (2015).

The different results for the 2012 and 2013 cohorts, with a lack of significant predictors of clinical performance in 2012, may be explained by similar factors to those discussed for academic assessments, with possible variations in the assessment process for the two groups. The students included in the clinical analysis were identical to those included in the academic analysis, with little difference between the 2012 and 2013 cohorts with regards to age, gender or ethnicity. There may of course be differences that do exist but have not been measured in these analyses. This is also suggested by the relatively large amount of variance that is not accounted for by the factors used in these analyses, as discussed below. Different standard setting methods used in OSCEs, for example, produce different outcomes (Kaufman et al., 2000), though compared to other clinical tests OSCEs are considered more objective, helping to overcome variations that exist between individual patients or examiners (Mossey et al., 2001). Further work is required to explore the KCLDI assessment process in greater depth, which may help explain the difference in results shown between the 2012 and 2013 cohorts.

McManus et al. (2013a) reported 65% of variance, in first-year basic medical science results, was accounted for by A-level performance. They speculated the other 35% may be due to personality, motivation or problems related to finance, peers, relationships or family. Such factors may offer an additional explanation for the differences observed between the 2012 and 2013 graduates and reinforce the rationale for conducting the questionnaire and interview strands of this research.

3.3.3.3 Pearson's correlation coefficients

Caution is needed when interpreting Pearson's correlation coefficients, as although the strength of the relationship between two variables can be measured (Rowntree, 1981 p.156), a relationship does not indicate causality (Prion & Haerling, 2014).

It was assumed that the assessments measured what they were intended to measure, with the construct (underlying attribute or skill) defined prior to test development (Gipps, 2012). However, this is not always the case and the GDC reported, in its Annual Review of Education 2014-2016, that several inspectors "...noted that marking and grading schemes were unclear and in need of review to improve the integrity of assessment outcomes..." (GDC, 2017). There is a need for dental schools to demonstrate student competence, with a clear framework in place to facilitate this as students progress from beginning to end of their programme. The demonstration of student competence is complicated however, necessitating elaborative procedures (Gipps, 2012), being learner specific (Dawson et al., 2016) and with theory and practice considered simultaneously, as practice and knowledge operate interdependently (Higgs et al., 2001).

If a poor correlation exists between assessments at the beginning and end of the programme, it may thus be a result of poor design, with the assessments not measuring what they were intended to measure. It is also possibly the result of a curriculum not aligned with the assessments, hence the need to develop assessments in conjunction with pedagogy (Kinchin et al., 2008b).

Alternatively, the assessments may be appropriate, however a poor correlation may result from candidates not behaving as expected, or to other factors not being measured influencing attainment.

As discussed above, McManus et al., 2013a showed 35% of the variance in a year-one basic medical science examination may be accounted for by factors including personality, motivation or problems related to finance, peers, relationships or family. The authors stated "...a major challenge has to be identifying the causes or the correlates of that additional variance..." (McManus et al., 2013a). Similarly, Ballard et al. (2015) explained that 64% of the variation they observed in dental school academic performance was not accounted for by admissions criteria (including prior academic attainment), and suggested "personalities, life events, etc, also have a major impact".

The correlation between overall scores at the beginning and end of the programmes ranged from 0.33 to 0.55 ($p < 0.05$) for the C2 and C3 programmes respectively, with 11% to 30% of the variance accounted for and 70% to 89% not accounted for. When considering the component parts of the examinations, the strongest correlation ($r = 0.66$, $p < 0.05$) in this research was shown between the BDS2 C3 (GPEP) ICA and the BDS5 OSCE. Thus even in the case of the strongest correlation, only about 44% of the variance was accounted for, with about 56% unaccounted for and due to other factors.

3.3.4 Summary of longitudinal analyses results

The majority of students moved between thirds or halves, for most analyses, as they progressed through their programmes. A student's gender did not predict his/her performance in academic assessments and ethnicity did not predict performance in clinical assessments. BDS1 overall results had a moderate correlation with BDS5 overall results for C1 and BDS2 overall results a moderate correlation with BDS5 overall results for C3 and C4, however most of the variance seen was not accounted for.

Having explored the manner in which students progress, the factors possibly associated with the unaccounted variance will be explored in the following questionnaire strand.

4 Chapter 4. Questionnaire

4.1 Method

4.1.1 Questionnaire design

The literature review established potential factors that could influence the progression of students. It was not feasible to include every factor within one questionnaire and so a series of pilot focus group discussions were conducted, to determine those perceived by KCLDI students as being the most relevant. A group of Year 4 undergraduate dental students (BDS4) were invited to participate in the pilot focus groups during Spring 2012. Convenience sampling was used, with the majority being students from the tutorial group of the principal researcher who volunteered to participate. Three pilot focus groups were convened, each lasting approximately one hour, with volunteers attending on just one occasion. A total of 26 individuals participated (nine GPEPs and 17 on the 5-year programme). The participants were asked to consider and discuss the factors that influenced their academic progression and field notes were taken. The students were also invited to write down, anonymously, any point they had felt unable to discuss during the session. Commonly recurring themes included financial concerns, the benefit of support networks, learning and teaching issues, and the importance of having a good clinical partner. The anonymous notes reported additional issues that influenced progression, including “living far from home” and “stress”.

The findings of the pilot focus group discussions, in addition to the review of the literature, informed the design of the questionnaire. The questionnaire

was designed to be completed in about 5-10 minutes to maximise the number of participants likely to fill it in.

In addition to basic demographic information, questions were devised to assess students' opinions on a range of issues that had the potential to affect their progression. Students were asked, for example, the extent to which their accommodation hindered their ability to study effectively, with questions about their journey to KCLDI, family responsibilities, resources (such as internet access), space to work, noise and social distractions. Levels of debt, both including and excluding tuition fees, were evaluated (as tuition fees varied considerably between different cohorts) and the extent to which any worry about debt affected their studies. Students were also asked to consider four different formats of teaching, (lectures, tutorials, chair-side and online) and asked what they felt about these different formats.

Some questions were relevant to BDS1 students and others only applicable to BDS5 students. For example, BDS1 students were asked about their transition from school to university and how difficult they found the change in teaching format, complexity and volume of work. The BDS5 students were asked whether they had been required to resit any of the end-of-year examinations (BDS1, BDS2, BDS3 or BDS4) and if so to indicate what, if any, factors contributed to their result. There were 30 questions common to both BDS1 and BDS5, with an additional six questions for BDS1 students and nine for those BDS5 students that had failed any end-of-year examinations.

A 14-item Perceived Stress Scale (PSS14) was incorporated (Cohen & Williamson, 1988) which has been previously validated and used in similar investigations on dental students (Singh et al., 2011).

An adjectival scale (Streiner et al., 2015) ranging from 0 to 4, was used with many of the questions, in addition to a “not applicable” option, which allowed quantification and ready analyses of the results. The questionnaire also invited students to give free-flowing written responses to some questions, enabling them to expand their answers. A tick box was included at the end of the questionnaire for individuals to indicate whether they would be willing to participate in follow-up focus groups and interviews.

4.1.2 Questionnaire pilot

A paper version of the questionnaire was piloted with 10 BDS1 and 12 BDS5 KCL dental undergraduates in May 2012. These individuals were not randomly selected but volunteered to participate, having learnt about the research project. Participants completed a feedback form to determine whether they found any questions ambiguous and were invited to make suggestions for improvement. Students were also asked whether they would be more likely to complete the questionnaire if presented in paper or electronic format. The majority (80% (n = 8) of BDS1 and 100% (n = 12) of BDS5) reported the questions were clear and unambiguous and 90% (n = 9) of BDS1 and 50% (n = 6) of BDS5 stated they were more likely to complete a paper than an online version (Table 19).

Table 19. Questions asked on the feedback form, related to the pilot questionnaire, and the number and proportion of BDS1 and BDS5 students who responded positively.

	BDS1 n (%)	BDS5 n (%)
Found questions clear and unambiguous	8 (80%)	12 (100%)
Found layout satisfactory/ easy to follow	9 (90%)	12 (100%)
More likely to complete if paper format	9 (90%)	6 (50%)
More likely to complete if online format	1 (10%)	3 (25%)
No preference for particular format	0 (0%)	3 (25%)

Some questions were edited to improve the outcome. For example, the debt question was expanded to six levels of debt, with and without the addition of tuition fees. The number of teaching options were reduced and "social life" added to the list of possible reasons for examination failure. A decision was taken to use a paper rather than online version of the questionnaire and the 10-item Perceived Stress Scale (PSS10) rather than the 14-item version. The PSS10 was designed to measure the degree to which situations in life are appraised as stressful (Cohen et al., 1983) and comprised a series of 10 questions, four of which were of a positive nature and six were negative. Each question was scored by students on a scale from zero to four.

4.1.3 Ethical approval

Ethical approval for the research was given by King's College Ethics Committee in September 2012 (reference BDM/11/12-117, Appendix 10.1).

4.1.4 Questionnaire 1 (Cohorts two, four and five)

4.1.4.1 Exclusion criteria

All students in BDS 1 (Cohort 5, C5) and BDS 5 (C2 and C4), during the 2012-2013 academic year (Table 3), were eligible to participate in the study, with the exception of those on the Dentistry Programme for Medical Graduates (DPMG). The DPMG students, at that time, comprised a small group of just eight individuals in BDS5 and were excluded due to the atypical nature of their student experience, being medical graduates on a three-year pathway.

4.1.4.2 Questionnaire preparation

Approximately 300 identical eight-page, single-sided, questionnaires were printed (Appendix 10.3.2). These were called Questionnaire 1 (Q1). A unique identifier, in the form of a code known only to the principal investigator, was added to each questionnaire and was linked to a specific student. The identifier enabled the questionnaire results to be analysed in conjunction with other data such as examination results. The process also allowed triangulation between the different strands of the research project. An information sheet was compiled (Appendix 10.3.1), outlining the nature of the research and making it clear that completion of the questionnaire was entirely voluntary. The information sheet and questionnaire were placed in an envelope with the student's name (corresponding to the unique identifier within) written on the front.

4.1.4.3 Sample size calculation

The power calculation for this study was based on multiple linear regression analysis of predicting various outcome measures (PSS score as an example) using 10 predictor variables. A study with an effect size of 0.176 (assuming a multiple correlation of 0.15) and a power of 80% require a total sample of 102 to find the significant predictors among the total of 10 predictor variables at 5% level of significance. The power calculation was carried out using the statistical power analysis programme, G*power, version 3.1.5 (Heinrich-Heine-Universität, Düsseldorf, Germany). The BDS1 and BDS 5 students were all invited to take part in this study, over two consecutive years, which resulted in 107 BDS 1 students and 121 BDS 5 students completing Questionnaire 1 in 2013 and 113 BDS 1 and 152 BDS 5 students completing Questionnaire 2 in 2014.

4.1.4.4 Data gathering

The principal investigator gave BDS1 and BDS5 undergraduates a verbal explanation about the nature of the research, at the beginning of normal teaching sessions in January and February 2013 and the envelope containing the questionnaire and information sheet was then distributed to each eligible student. Care was taken to ensure that students received the questionnaire with their unique number and were instructed not to swap questionnaire papers with colleagues. The students were requested to return the questionnaires in the envelope, thus ensuring individuals would not feel embarrassed should they wish to return an uncompleted questionnaire. A further, final invitation to participate was made approximately two weeks

later, to those individuals that had been absent during the initial distribution session. No incentives to complete the questionnaire were provided.

4.1.4.5 Processing of data

Data from the completed questionnaires were processed and entered on an excel spreadsheet. The questionnaire asked students to give their age, requesting that one of seven possible age bands was circled. To assist with the data analyses, these seven groups were condensed to five, by combining the “under 18”, “18” and “19” bands into an “under 20” one. The six debt bands were similarly condensed into four bands, “0”, “under £10,000”, “£10,000-£19,000” and “£20,000 and over”.

The PSS score for each student was calculated, using the standard protocols (Cohen & Williamson, 1988). The protocol involved reversing the scores of the four positively worded questions, (so that a student’s score of 0=4, 1=3, 2=2, 3=2, 4=0) and adding these to the scores for the six negatively worded questions to give an overall score, ranging from 0 to 40. All students whose PSS score was greater than one standard deviation higher than the mean norm value, for their gender (Cohen, 1994) were identified. These individuals, with high levels of perceived stress, were contacted and given information of KCL counselling services and advised to consider speaking to their Personal Tutor.

The BDS1 and BDS5 end-of-year examination results were obtained from the KCLDI Examinations Office. Cronbach alpha was calculated for the use

of the perceived stress scale within the questionnaire in order to assess the internal consistency of items. Comparisons were made between the results for BDS1 and BDS5 students, between males and females and between different age bands. A range of statistical tests was undertaken, including independent samples t test, chi-squared test, Mann-Whitney test, parametric one-way ANOVA, Kruskal-Wallis non-parametric one-way ANOVA and multiple regression analyses. All the analyses were performed using SPSS® (Version 23, IBM®, Armonk, New York) and STATA® (Version 12, StataCorp LP, TX, USA). A statistician assisted with the statistical analysis.

4.1.5 Questionnaire 2 (Cohorts six, seven and eight)

4.1.5.1 Rationale for repeating the questionnaire

The questionnaire was repeated with a second group of students, those in BDS1 (Cohort 6, C6) and BDS5 (Cohort 7, C7 and Cohort 8, C8) during the 2013-2014 academic year (Table 3). This was called Questionnaire 2 (Q2). The rationale was to compare the results between Q1 and Q2 to determine any patterns.

4.1.5.2 Modifications made to questionnaire and ethical approval

Reflection upon the Q1 analysis process led to additional questions being incorporated within Q2 and refinements made. These included how long the journey to university took, whether individuals were international students and determining if they felt that workshops were a useful teaching method.

The majority of new graduates undertake a year of supervised and mentored clinical practice in a general dental practice setting, known as Dental Foundation Training Year 1 (DF1). The allocation of individuals to specific training practices, involves students in England, Wales and Northern Ireland undertaking a competitive interview process during the Autumn term of their final year. The process results in students being given a national DF1 ranking, with the highest-ranking students more likely to be allocated the practice of their choosing. In Q2 the BDS5 students were asked to give their DF1 ranking.

The first group of BDS1 and BDS5 students, described in Section 4.1.4 (C2, C4 and C5), all received the same questionnaire (Questionnaire 1) and were requested to answer the questions applicable to their year group. A different approach was used for Questionnaire 2, whereby BDS1 (C6) received a questionnaire tailored to them, as did BDS5 students (C7 and C8). The rationale for this change of approach was that it avoided students having to navigate their way around the questionnaire, avoiding questions intended for a different year group, thus reducing the chance of any questions being overlooked. An ethics modification request to repeat the questionnaire, with a further group of students, was given by King's College Ethics Committee in October 2013 (Appendix 10.1.3).

4.1.5.3 Eligibility and exclusion criteria, data gathering and processing

All BDS1 and BDS5 students during the 2013-2014 academic year, were eligible to participate in the study, with the exception of the DPMGs, as

above. The data collection process was identical to that used for Q1, with a verbal explanation being given, followed by distribution of the envelopes containing the questionnaire and information sheet. The initial distribution occurred during January and February 2014 and a further, final, invitation to participate was made approximately two weeks later. Data from the completed questionnaires were processed and a statistical analysis conducted, in an identical way as for Q1. All students with a PSS score greater than 1 standard deviation higher than the mean norm value for their gender (Cohen, 1994) were contacted and given information of KCL counselling services and advised to consider speaking to their Personal Tutor.

Pearson's correlation coefficient was calculated between students' DF1 rankings and their BDS5 percentage score. United Kingdom Clinical Aptitude Test (UKCAT) scores were obtained for the BDS5 students, from the KCLDI Admissions Office. Pearson's correlation coefficient was calculated between students' DF1 rankings and UKCAT score and between BDS5 percentage score and UKCAT score.

4.2 Results

4.2.1 Questionnaire 1 (C2, C4 and C5. 2012-2013 academic year)

4.2.1.1 BDS1 (C5) demographic information

The BDS1 year consisted of 129 students and 107 (83.0%) completed the questionnaire (Table 20), 46 (43.0%) males and 61 (57.0%) females (Table 21). The majority (70.1%, n = 75) were aged under-20 years, 27.1% (n = 29) aged 20-24 and 2.8% (n = 3) aged over-24 with 14.0% (n = 15) already having a degree (Table 21). 43.0% (n = 46) of BDS1 students lived in university halls of residence, with a similar number living in their parental home (40.2%, n = 43) and a smaller proportion (11.2%, n = 12) living in a student flat/house share (Table 22).

4.2.1.2 BDS5 (C2 and C4) demographic information

The BDS5 year had 146 students, 121 (82.9%) completed the questionnaire (Table 20), of whom 46 (38.0%) were male and 75 (62.0%) female (Table 21). The majority (76.9%, n = 93) were aged 20-24 and 23.1% (n = 28) aged over 24. The GPEPs (C4) comprised 25 (20.7%) of the respondents (Table 21) and 34 (28.1%) of BDS5 (C2 and C4) had a degree (this result excluded one student who indicated they had an intercalated degree). The majority of BDS5 students lived in a student flat/house share (51.7%, n = 62) with approximately one third (34.2%, n = 41) living in their parental home (Table 22). One individual responded “50/50” and so was excluded from the analyses.

Table 20. Questionnaire distribution and completion rates for BDS1 and BDS5. The figures in brackets represent the percentage of the total, in each year, eligible to complete the questionnaire.

	BDS1 n (%)	BDS5 n (%)
Eligible to complete questionnaire	129 (100.0)	146 (100.0)
Completed questionnaires	107 (83.0)	121 (82.9)
Not given questionnaire	6 (4.7)	9 (6.2)
Given questionnaire but did not complete it	16 (12.4)	16 (11.0)

Table 21. Questionnaire demographic details for BDS1 and BDS5. The figures in brackets represent the percentage of the total, in each year group, that completed the questionnaire.

	BDS1 n (%)	BDS5 n (%)
Completed questionnaire	107 (100.0)	121 (100.0)
Male respondents	46 (43.0)	46 (38.0)
Female respondents	61 (57.0)	75 (62.0)
Aged under-20	75 (70.1)	0 (0.0)
Aged 20-24	29 (27.1)	93 (76.9)
Aged over 24	3 (2.8)	28 (23.1)
GPEP	N/A	25 (20.7)
Have degrees	15 (14.0)	34 (28.1)

Table 22. Number and proportion of students living in different accommodation types, for BDS1 and BDS5. The figures in brackets represent the percentage of the total, in each year group, that answered the question.

Accommodation type	BDS1 n (%)	BDS5 n (%)
Parental home	43 (40.2)	41 (34.2)
Student share	12 (11.2)	62 (51.7)
Own home	3 (2.8)	9 (7.5)
University halls of residence	46 (43.0)	2 (1.7)
Other	3 (2.8)	6 (5.0)
No answer given	0 (0.0)	1 (0.9)

4.2.1.3 Accommodation

The mean adjectival scale scores for all the BDS1 and BDS5 questions were below 2.00, apart from social distractions. BDS1 had a mean score of 2.22 ±1.34 and BDS5 a mean score of 2.40 ±1.23 (Table 23).

Table 23. Factors related to students' accommodation with the corresponding mean (SD) and median (min, max) scores and p values for BDS1 and BDS5. A score of 0 = no hindrance to studies, 4 = a significant hindrance to studies. (Mann-Whitney test).

	BDS1		BDS5		p value
	Mean (SD)	Median (min, max)	Mean (SD)	Median (min, max)	
Difficulty with journey	1.30 (1.39)	1.00 (0, 4)	1.59 (1.32)	1.00 (0, 4)	0.07
Family responsibilities	0.90 (1.23)	0.00 (0, 4)	1.18 (1.41)	1.00 (0, 4)	0.14
Lack of resources	0.53 (0.97)	0.00 (0, 4)	0.72 (1.20)	0.00 (0, 4)	0.28
Lack of space to work	0.81 (1.15)	0.00 (0, 4)	1.22 (1.42)	1.00 (0, 4)	0.03
Noise	1.68 (1.27)	2.00 (0, 4)	1.60 (1.39)	1.00 (0, 4)	0.55
Social distractions	2.22 (1.34)	2.00 (0, 4)	2.40 (1.23)	3.00 (0, 4)	0.36

In BDS1 22 (20.6%) students scored the social distractions question a 4 and in BDS5 24 (19.8%) students did. The only statistically significant difference between the BDS1 and BDS5 results was for the "lack of space to work" which was higher for BDS5 (Mann-Whitney test, p = 0.03). There was no statistical difference in any response for gender (Appendix 10.3.3, Table 67). The comparison between age-bands observed that the under-20 and over-24 bands had a higher median score (3.00), than the 20-24 band (2.00) for "social distractions", but the only statistically significant difference was

observed for “difficulty with journey” (Kruskal-Wallis test, p = 0.01) (Appendix 10.3.3, Table 68).

Analysis of the free-flow text section showed that travel time was the most commonly reported topic mentioned by BDS1 students: *“...adds 3 hours on to my day, so I lose out on study time...”*. In the case of BDS5 students, a wide range of factors were mentioned, including inefficient heating and family commitments, however, social distractions and noise were the most common.

4.2.1.4 Finance

The analysis of debt levels, including tuition fees, observed that the debt-band containing the highest number of BDS1 students (45.8%, n = 49), was £10,000-£19,999, compared to BDS5 where 80 students (67.2%) recorded debt levels of £20,000 and over. Excluding tuition fees, 98 (94.2%) of BDS1 students recorded debts under £10,000 and of BDS5 students, 50 (43.5%) had debt levels of £20,000 and over (Table 24). The association between BDS1 and BDS5 was statistically significant in both cases (chi-squared test, p < 0.001). There was no statistically significant association between gender (chi-squared test, p = 0.89) for debt including tuition fees, with 51 (38.1%) females and 34 (37.0%) males having debts of £20,000 and over (Appendix 10.3.3, Table 69). The exclusion of tuition fees resulted in 80 (61.5%) females and 59 (66.3%) males with debts of under £10,000 or no debt. There was no statistically significant association observed between gender and levels of debt, excluding tuition fees (chi-squared test, p = 0.88).

Table 24. Different debt bands and number and proportion of BDS1 and BDS5 students within each band, both including and excluding tuition fees. (Chi-squared test, p < 0.001 for comparison between year groups, both including and excluding tuition fees). The figures in brackets represent the percentage of the total, in each year group, that answered the question.

	BDS1		BDS5	
Debt	With tuition fees n (%)	Excluding tuition fees n (%)	With tuition fees n (%)	Excluding tuition fees n (%)
0	24 (22.4)	44 (42.3)	16 (13.5)	20 (17.4)
<£10,000	29 (27.1)	54 (51.9)	6 (5.0)	21 (18.3)
£10,000 to £19,999	49 (45.8)	5 (4.8)	17 (14.3)	24 (20.9)
£20,000 and over	5 (4.6)	1 (1.0)	80 (67.2)	50 (43.5)
Total	107 (100.0)	104 (100.0)	119 (100.0)	115 (100.0)

The variation in debt levels with age (including tuition fees), observed that 36 (48.0%) under-20's reported debt between £10,000-£19,999 (Appendix 10.3.3, Table 70), for 72 (60.0%) 20-24 year olds and 13 (41.9%) over-24's, the debt increased to £20,000 and over. Excluding tuition fees, 38 (52.0%) of under-20's recorded less than £10,000, for 42 (36.2%) of 20-24 year olds and 9 (30.1%) over-24's the debt recorded was £20,000 and over. There was a statistically significant association between age bands (chi-squared test, $p < 0.001$).

A similar proportion of BDS1 and BDS5 students reported undertaking some form of paid employment, with 21 (20.0%) BDS1 students and 25 (20.6%) BDS5 students (Table 25). There was no statistically significant association (chi-squared test, $p = 0.97$) between genders (Appendix 10.3.3, Table 71). A

greater proportion of students aged 25-and-over, undertook paid work, with 11 (35.6%) doing so, compared to 13 (17.7%) of the under-20s and 22 (18.2%) of the 20-24 year-olds, though the finding was not statistically significant (chi-squared test, p = 0.24; Appendix 10.3.3, Table 72).

Table 25. Number and proportion of BDS1 and BDS5 students with no paid employment, 1-5 hours of employment, 6-10 hours or 11 or more hours, per week. (Chi-squared test, p = 0.79). The figures in brackets represent the percentage of the total, in each year group, that answered the question.

Hours worked (per week)	BDS1 n (%)	BDS5 n (%)	Total n (%)
0	84 (80.0)	96 (79.3)	180 (79.6)
1-5	10 (9.5)	13 (10.7)	23 (10.2)
6-10	5 (4.8)	8 (6.6)	13 (5.8)
11 or more	6 (5.7)	4 (3.3)	10 (4.4)
Total	105 (100.0)	121 (100.0)	226 (100.0)

Students generally reported low levels of worry about debt affecting studies, but there was a statistical difference between BDS 1 and 5 (Mann-Whitney test, p = 0.05) (Table 26). In BDS1 seven (6.5%) students scored this question a 4 and in BDS5 11 (9.1%) students did. The analysis of age-bands (Appendix 10.3.3, Table 73) observed similarly low scores, with the under-20's having the lowest median score (0.00) and the over-24's the highest median score (2.00). A statistically significant difference in scores was observed between age bands (Kruskal-Wallis test, p < 0.001). Two BDS1 students and one BDS5 student, with no debt, gave scores of two, four and three respectively, and were included in the analysis. One BDS5 student was excluded from the analysis of this question because they circled two answers.

The students that undertook paid employment were asked to what extent this affected their studies. The question had 47 respondents and analysis observed median scores of 2.00 or below for both year-groups (Table 26), for females (Table 27) and the under-24's (Appendix 10.3.3, Table 73).

Table 26. Students' worry about debt and the effect of paid work on their studies, with corresponding mean (SD) and median (min, max) scores and p values for BDS1 and BDS5. A score of 0 = no effect on studies, 4 = significant / considerable effect on studies. (Mann-Whitney test). The percentage figures in brackets represent the proportion of students who answered the question, relative to the total number of completed questionnaires (BDS1 and BDS5 combined).

	BDS1		BDS5		Respondents n (%)	p value
	Mean (SD)	Median (min, max)	Mean (SD)	Median (min, max)		
Worry about debt	1.02 (1.28)	1.00 (0, 4)	1.35 (1.35)	1.00 (0, 4)	210 (92.1)	0.05
Effect of paid work on studies	2.05 (1.40)	2.00 (0, 4)	2.20 (1.16)	2.00 (0, 4)	47 (20.6)	0.70

Table 27. Students' worry about debt and the effect of paid work on their studies, with corresponding mean (SD) and median (min, max) scores and p values for females and males. A score of 0 = no effect on studies, 4 = significant / considerable effect on studies. (Mann-Whitney test). The percentage figures in brackets represent the proportion of students who answered the question, relative to the total number of completed questionnaires (males and females combined).

	Female		Male		Respondents n (%)	p value
	Mean (SD)	Median (min, max)	Mean (SD)	Median (min, max)		
Worry about debt	1.19 (1.31)	1.00 (0, 4)	1.20 (1.35)	1.00 (0, 4)	210 (92.1)	0.86
Effect of paid work on studies	2.14 (1.16)	2.00 (0, 4)	2.11 (1.45)	3.00 (0, 4)	47 (20.6)	0.88

The over-24's and males both had a median score of 3.00 and there was a statistically significant difference between age-band scores (Kruskal-Wallis test, p = 0.04). A score of "0" was given by 27 BDS1 students and 17 BDS5 students and one BDS5 student scored "4" despite doing no paid work, and so all were categorised as "not applicable" and excluded from the analysis.

4.2.1.5 Teaching methods

The highest scores were reported for tutorials and chairside teaching, with mean scores of at least 3.28 ±0.77 and 3.55 ±0.69 respectively (Table 28, Appendix 10.3.3, Table 74, Appendix 10.3.3, Table 75).

Table 28. Different teaching methods, with corresponding mean (SD) and median (min, max) scores and p values for BDS1 and BDS5. A score of 0 = no benefit, 4 = extremely useful. (Mann-Whitney test).

	BDS1		BDS5		p value
	Mean (SD)	Median (min, max)	Mean (SD)	Median (min, max)	
Lectures	2.25 (0.82)	2.00 (0, 4)	2.25 (1.15)	2.00 (0, 4)	0.66
Tutorials	3.45 (0.69)	4.00 (1, 4)	3.28 (0.77)	3.00 (1, 4)	0.09
Chairside	3.62 (0.66)	4.00 (1, 4)	3.75 (0.51)	4.00 (2, 4)	0.11
Online	2.62 (0.95)	3.00 (0, 4)	1.88 (1.13)	2.00 (0, 4)	<0.001

The lectures and online teaching produced comparatively lower scores for BDS1 and 5. BDS1 reported statistically significantly higher scores than BDS5 (Mann-Whitney test, p < 0.001) for online. One BDS5 student scored "0-4 depending" for the lecture question and one BDS5 student did the same for the tutorial question and so both students were excluded from this

analysis. There were no statistical differences for gender (Table 74). There was a statistically significant difference (Kruskal-Wallis test, p = 0.01) between age-bands for online (Table 75), where the under-20 year group scored higher online scores than the others (under-20 scored a median of 3.00, 20-to-24 scored 2.00 and 25-and-over 2.00).

4.2.1.6 Transition from school to university

Twelve male and twelve female students reported a gap-year; 9 (75.0%) males and 8 (66.7%) females reported this had influenced their progression through BDS1 (Table 29).

Table 29. Number and proportion of male and female students who undertook a gap-year and the number and proportion that felt a gap year influenced progression through BDS1. (Chi-squared test). The figures in brackets represent the percentage of the total, for each gender, that answered the question.

	Female n (%)	Male n (%)	p value
Gap year undertaken?			0.49
Yes	12 (23.5)	12 (30.0)	
No	39 (76.5)	28 (70.0)	
Total	51 (100.0)	40 (100.0)	
Did gap year influence progression through BDS1?			0.99
Yes	8 (66.7)	9 (75.0)	
No	4 (33.3)	3 (25.0)	
Total	12 (100.0)	12 (100.0)	

Students were asked to explain the nature of this influence using free-flow text; the majority expressed that the effect on progression was positive with several commenting that they felt more mature. A difficulty readjusting to studying was reported, by four students, to be a negative effect.

The BDS1 students reported high scores for the difference in volume of work between school and university, with a mean of 3.06 (±0.82) for females and 3.25 (±0.78) for males. There was no statistically significant difference between gender (Appendix 10.3.3, Table 76). Lower scores were reported for change in teaching styles and change in complexity/difficulty of work, with moving away from parents having the lowest score of 1.87 (±1.14) for females and 1.52 (±1.33) for males (Appendix 10.3.3, Table 76). Analysis of the free-flow text, observed students most commonly cited the need for self-directed learning and a lack of past examination papers as affecting their transition.

4.2.1.7 BDS5 examination resit questions

Most (66.1%, n = 74) BDS5 students did not resit any end-of-year BDS examination. From the 38 that did resit, the majority (76.3% n = 29) involved one resit, but nine students (23.7%) reported resitting more than one examination (Table 30).

Table 30. Number and proportion of BDS5 students that had not undertaken any BDS resit examinations, or had undertaken one or more resits. The figures in brackets represent the percentage of the total 112 responses to the question.

Examinations that required resitting	n (%) (112 responses)
None	74 (66.1)
BDS1 only	7 (6.3)
BDS2 only	8 (7.1)
BDS3 only	1 (0.9)
BDS4 only	13 (11.6)
More than one exam	9 (8.0)

The cause most commonly reported as greatly contributing to examination failure, by 11 (29.7%) students, was “family problems” with “health problems” also cited by 9 (25.7%) (Table 31). Conversely, “financial issues” and “learning and teaching issues” were perceived to be a contributory factor by one student (2.8%) and two students (5.6%) respectively. The free-flow text comments gave a few additional details, including *“...did not know how to write essays”* and *“lack of family support as live away from home”.* Included in the analysis were six students who had failed more than one examination, though gave just one score. Two students gave two responses to the same question and were excluded from the analysis.

Table 31. Causes contributing to BDS5 students failing a BDS examination: proportion of students scoring a four (indicating a greatly contributing factor). The figures in brackets represent the percentage of the total number of respondents to each contributing cause.

Contributory cause to failing	Number of respondents	Respondents scoring this question a 4 n (%)
Accommodation issues	37	6 (16.2%)
Family problems	37	11 (29.7%)
Financial issues	36	1 (2.8%)
Health problems	35	9 (25.7%)
Learning / teaching issues	36	2 (5.6%)
Relationship problems	36	7 (19.4%)
Social life	37	5 (13.5%)
Lack of study	35	3 (8.6%)

The odds ratio of a male student resitting an end-of-year BDS examination (BDS1 to BDS4) was 2.27 (CI 0.91, 5.67) indicating there were higher odds of males resitting than females, though this was not statistically significant. (Appendix 10.3.3, Table 77).

4.2.1.8 Perceived stress scale (PSS)

The Cronbach alpha value, for the PSS used within the questionnaire was 0.87, indicating the items were internally consistent.

The mean PSS score for females was higher than males (20.23 ±6.59 and 16.92 ±7.31 respectively) and this difference was statistically significant (t-test, p = 0.001) (Table 32). Similarly the PSS scores were statistically different for the year-groups (t-test, p = 0.004) and between different age-bands (one-way ANOVA, p = 0.005). Post hoc tests observed a significant difference (p = 0.004) between the <20 and the 20-24 age-band, with the latter reporting a higher mean score. There was no significant difference between the 5-year programme and GPEP students (t-test, p = 0.16).

Of the different accommodation categories, students living in their own home had the highest PSS scores (21.58 ±6.08) whilst those resident in university halls of residence had the lowest (17.04 ±5.79), although this was not statistically significant (one-way ANOVA, p = 0.18).

Table 32. Mean and median Perceived Stress Scale (PSS) scores and p values for gender, BDS year, age band, programme and accommodation type. (p value: a = t-test, b = one-way ANOVA).

	Mean PSS score (SD)	Median (min, max)	p value
Gender:			0.001[a]
Female	20.23 (6.59)	20.00 (7, 38)	
Male	16.92 (7.31)	17.00 (1, 36)	
BDS year:			0.004[a]
BDS1	17.48 (6.17)	17.00 (5, 33)	
BDS5	20.16 (7.58)	20.00 (1, 38)	
Age:			0.005[b]
Under-20	16.74 (5.97)	16.50 (5, 32)	
20 to 24	20.09 (7.43)	20.00 (1, 38)	
25 or over	19.47 (7.04)	18.50 (7, 33)	
BDS5 on GPEP / 5-year programme:			0.16[a]
5-year	20.66 (7.66)	20.00 (1, 38)	
GPEP	18.21 (7.05)	17.00 (3, 30)	
Accommodation:			0.18[b]
Parental home	19.37 (7.12)	20.00 (3, 36)	
Own	21.58 (6.08)	21.50 (13, 30)	
Student flat/house share	18.92 (7.30)	19.00 (1, 38)	
University hall of residence	17.04 (5.79)	17.00 (7, 31)	
Other	21.22 (10.55)	24.00 (6, 32)	

The students with debts of £20,000 and over (including tuition fees) had a higher mean PSS score (19.70 ±7.97) than those with lower debts, and when tuition fees were excluded, the difference in PSS scores between debt-bands reached statistical significance (one-way ANOVA, p = 0.02; Table 33). Post hoc tests observed a significant difference (p = 0.02) between those students <£10,000 in debt and those with debts of £10,000 - £19,999, with the latter reporting a higher mean score.

Table 33. Mean and median Perceived Stress Scale (PSS) scores and p values for different debt bands, including and excluding tuition fees. (One-way ANOVA).

	Mean (SD)	Median (min, max)	p value
Debt (with tuition fees)			0.45
0	19.08 (7.13)	20.00 (5, 36)	
<£10,000	18.43 (5.49)	18.00 (8, 33)	
£10,000 - £19,999	17.85 (6.48)	18.00 (5, 33)	
£20,000 and over	19.70 (7.97)	19.00 (1, 38)	
Debt (excluding tuition fees)			0.02
0	18.97 (6.15)	20.00 (5, 32)	
<£10,000	17.08 (6.45)	17.00 (3, 36)	
£10,000 - £19,999	21.59 (6.66)	20.00 (7, 34)	
£20,000 and over	19.65 (8.29)	19.00 (1, 38)	

Analysis of the BDS1 PSS scores observed 25 (23.8%) were between one and two standard deviations higher than the norm values (Cohen, 1994) and 11 (10.5%) were over two standard deviations higher. The analysis of BDS5 PSS scores observed 34 (28.8%) were between one and two standard deviations higher than the norm values and 29 (24.6%) were over two standard deviations higher.

4.2.2 Questionnaire 2 (C6, C7 and C8. 2013-2014 academic year)

4.2.2.1 BDS1 (C6) demographic information

The BDS1 year contained 122 students, 113 (92.6%) completed the questionnaire (Table 34) of whom 49 (43.4%) were male and 64 (56.6%) female (Table 35). The majority (70.8%, n = 80) were aged under-20 years, with 29 (25.7%) aged 20-24 and 4 (3.5%) aged over-24. The respondents included 8 (7.1%) International students (Table 35). The proportions reported were similar to questionnaire 1 (Q1).

Table 34. Questionnaire distribution and completion rates for BDS1 and BDS5. The figures in brackets represent the percentage of the total, in each year, eligible to complete the questionnaire.

	BDS1 n (%)	BDS5 n (%)
Eligible to complete questionnaire	122 (100.0)	157 (100.0)
Number of completed questionnaires	113 (92.6)	152 (96.8)
Not given questionnaire	1 (0.8)	1 (0.6)
Given questionnaire but did not complete it	8 (6.6)	4 (2.6)

Table 35. Questionnaire demographic details for BDS1 and BDS5. The figures in brackets represent the percentage of the total, in each year group, that completed the questionnaire.

	BDS1 n (%)	BDS5 n (%)
Male respondents	49 (43.4)	52 (34.2)
Female respondents	64 (56.6)	100 (65.8)
Proportion aged under-20	80 (70.8)	0 (0.0)
Proportion aged 20-24	29 (25.7)	121 (79.6)
Proportion aged over-24	4 (3.5)	31 (20.4)
Proportion of GPEPs	N/A	24 (15.8)
International students	8 (7.1)	10 (6.6)

The majority of BDS1 students (58.0%, n = 65) lived in university halls of residence, with almost one quarter (24.1%, n = 27) living in their parental home and a smaller proportion (11.6%, n = 13) living in a student flat/house share (Table 36). There were differences to Q1 with a higher proportion of BDS 1 reporting living at home in Q1 than Q2 (40.2% and 24.1% respectively).

Table 36. Number and proportion of students living in different accommodation types, for BDS1 and BDS5. The figures in brackets represent the percentage of the total, in each year group, that answered the question.

Accommodation type	BDS1 n (%)	BDS5 n (%)
Parental home (%)	27 (24.1)	46 (30.9)
Student share (%)	13 (11.6)	69 (46.3)
Own home (%)	5 (4.5)	20 (13.4)
University halls (%)	65 (58.0)	8 (5.4)
Other (%)	2 (1.8)	6 (4.0)
No answer given (%)	1 (0.9)	3 (2.0)

4.2.2.2 BDS5 (C7 and C8) demographic information

The BDS5 year contained 157 students, 152 (96.8%) completed the questionnaire (Table 34), of whom 52 (34.2%) were male and 100 (65.8%) female (Table 35). No respondents were aged under-20, with the majority (79.6%, n = 121) aged 20-24 and 31 (20.4%) aged over-24. The GPEPs (C8) comprised 24 (15.8%) of the respondents and International students 10 (6.6%) (Table 35). One student indicated they were a GPEP on the questionnaire, but after checking the data from KCLDI Registry, they were determined to be on the 5-year pathway and so analysed with the 5-year group. 69 (46.3%) BDS5 students lived in a student flat/house share, with

almost one third (30.9%, n = 46) living in their parental home (Table 36). A questionnaire was returned with a missing page and so no information was collected regarding any prior degree or DF1 ranking for that individual. The data from Q2 were similar to that of Q1.

4.2.2.3 Previous degree (question new to Questionnaire 2)

A previous degree had been undertaken by 15 (13.3%) BDS1 students, with dental materials (n = 4) and biomedical sciences (n = 4) the subjects most commonly studied. When asked to rate the extent to which their previous degree helped their progression through BDS1, these students scored a mean of 2.73 (±1.03), where 0 indicated “no help” and 4 indicated “a significant help” (Table 37). For BDS5, 32 (21.3%) had a prior degree, the most common subject being biomedical sciences (6 students). A similar mean score (2.77 ±0.97) was given for the extent to which the degree helped their progression through BDS5. BDS1 students were invited to comment, in the free-flow text section, on how their previous degree affected progression; most described similarities in content between BDS1 and their previous degree, which they perceived as having helped progression. For BDS5 students, having a degree was perceived to have resulted in an increased level of maturity and confidence, with an associated ability to communicate effectively with patients: *“I feel more mature now and find it easier to communicate with patients than I would have when I was younger”.*

Table 37. Number and proportion of BDS1 and BDS5 students with a prior or intercalated degree, and the mean score for the question "Did the degree help progression?" A score of 0 = no help, 4 = significant help. The percentage figures in brackets represent the proportion of the total, in each year group, that answered the question.

	BDS1	BDS5
Proportion with degree. n (%)	15 (13.3) (113 respondents)	32 (21.3) (150 respondents)
Degree was intercalated. n (%)	N/A	5 (16.7) (30 respondents)
Mean score (SD)	2.73 ±1.03 (15 respondents)	2.77 ±0.97 (30 respondents)

4.2.2.4 Accommodation

The accommodation question scores, for the BDS1 and BDS5 students, were similar to Q1 (Appendix 10.3.6, Table 78). Unlike Q1, there was a statistically significant difference between BDS1 and BDS5 scores for the family responsibility, lack of resources, lack of space to work and noise questions (Mann-Whitney test, p = 0.045, <0.001, 0.046 and 0.048 respectively). (Table 38 and Table 78).

Table 38. Factors related to students' accommodation. The family responsibilities, lack of resources and noise questions and corresponding mean (SD) and median (min, max) scores and p values for BDS1 and BDS5. A score of 0 = no hindrance to studies, 4 = a significant hindrance to studies. (Mann-Whitney test).

	BDS1		BDS5		p value
	Mean (SD)	Median (min, max)	Mean (SD)	Median (min, max)	
Family responsibilities	0.66 (1.00)	0.00 (0, 4)	0.99 (1.24)	0.00 (0, 4)	0.045
Lack of resources	0.76 (1.04)	0.00 (0, 4)	0.32 (0.78)	0.00 (0, 4)	<0.001
Lack of space to work	0.98 (1.15)	1.00 (0,4)	0.74 (1.11)	0.00 (0,4)	0.046
Noise	1.64 (1.21)	2.00 (0, 4)	1.36 (1.25)	1.00 (0, 4)	0.048

There were no statistically significant differences between males and females for accommodation, and results were similar to Q1 (Appendix 10.3.6, Table 79). Likewise, the age-band scores were similar to Q1 (Appendix 10.3.6, Table 80) but unlike Q1, there were statistically significant differences between age-groups for the family responsibilities question (Kruskal-Wallis test, p = 0.01) and lack of resources (Kruskal-Wallis test, p = 0.01) but no statistically significant difference for the journey question (Kruskal-Wallis test, p = 0.20) (Table 39 and Table 80).

Table 39. Factors related to students' accommodation. The difficulty with journey, family responsibility and lack of resources questions and corresponding mean (SD) and median (min, max) scores and p values for age-bands. A score of 0 = no hindrance to studies, 4 = a significant hindrance to studies. (Kruskal-Wallis test).

	Under 20		20 to 24		25 or over		p value
	Mean (SD)	Median (min, max)	Mean (SD)	Median (min, max)	Mean (SD)	Median (min, max)	
Difficulty with journey	1.24 (1.38)	1.00 (0, 4)	1.37 (1.29)	1.00 (0, 4)	1.69 (1.39)	1.00 (0, 4)	0.20
Family responsibilities	0.51 (0.83)	0.00 (0, 3)	0.90 (1.16)	0.00 (0, 4)	1.41 (1.52)	1.00 (0, 4)	0.01
Lack of resources	0.78 (1.10)	0.00 (0, 4)	0.40 (0.79)	0.00 (0, 4)	0.38 (0.94)	0.00 (0, 4)	0.01

One-way journey times to university, of 30 minutes or less, were undertaken by 71 (63.4%) of BDS1 (Table 40), and 14 (12.5%) had journey times of over one hour. A greater proportion of females than males had journey times of over one hour (17.2%, n = 11 compared to 6.3%, n = 3 respectively). The analysis by age observed that 71 students (65.7%) aged under-25, had journey times of 30 minutes or less, though the four older students all had journey times of over 30 minutes (Appendix 10.3.6, Table 81). The BDS5

students worked at more than one campus, resulting in 14 students giving two answers to this question, so further analysis of this group was not undertaken.

Analysis of the free-flow text section observed that the BDS1 students gave a range of accommodation factors affecting progression. Examples included: *"lack of parental supervision"*, *"too many distractions"* and *"it's not entirely safe...got burgled on the first day"*.

Table 40. Journey time to university (one-way) undertaken by female and male students. (Chi-squared test, p = 0.08). The figures in brackets represent the percentage of the total, for each gender, that answered the question.

	Female n (%)	Male n (%)	Total n (%)
<10 minutes	21 (32.8)	12 (25.0)	33 (29.5)
10-30 minutes	16 (25.0)	22 (45.8)	38 (33.9)
31 – 60 minutes	16 (25.0)	11 (22.9)	27 (24.1)
Over 60 minutes	11 (17.2)	3 (6.3)	14 (12.5)
Total	64 (100.0)	48 (100.0)	112 (100.0)

For BDS5 students, noise was commonly cited, as in Q1. Financial issues were also frequently mentioned: *"My rent means I don't have much money left over each month, which increases stress levels, affecting my working ability"*. A lack of heating was mentioned by some: "...sometimes the flat is too cold to study...", "Not able to afford heating" and safety were also cited: *"The area where I live is too dangerous to walk home late at night, which reduces the time I can spend studying at the library..."*. Travel time, as in Q1, was raised by several BDS5 students, who explained the commute left them

feeling tired, leading to difficulties studying: *"...tired during weeknights and find it hard to study after 1-1½ hours on the tube".*

4.2.2.5 Finance

The analysis of debt levels in BDS1 and BDS5, observed similar results to Q1, both for tuition fees included and excluded (Appendix 10.3.6, Table 82). As with Q1, the association between BDS1 and BDS5 was statistically significant in both cases (chi-squared test, $p < 0.001$). The analysis of male and female debt levels, with tuition fees included, observed similar levels of debt (Appendix 10.3.6, Table 83). Unlike Q1 however, the exclusion of tuition fees resulted in a statistically significant association between genders (chi-squared test, $p = 0.03$) with 70 (43.5%) females and 29 (30.2%) males having debts of £10,000 or more. The "debt excluding tuition fees" for one student was excluded from the analysis as it was a greater value than the "debt including tuition fees". The analysis of debt levels within different age-bands, observed broadly similar patterns to Q1, (Appendix 10.3.6, Table 84) though a greater proportion of the 25-and-over group had debts of £20,000-and-over (60.0%, n = 21, including tuition fees, compared to 41.9%, n = 13).

The analysis of hours spent in paid employment observed broadly similar results to Q1, with no statistically significant associations between year groups or between genders (Appendix 10.3.6, Table 85 and Table 86). Unlike Q1, a statistically significant association (chi-squared test, $p < 0.001$) was observed between age-bands, with 11 (13.8%) of under-20 year-olds

undertaking paid work, 34 (22.8%) of the 20-24 year-olds, and 15 (44.1%) of the 25 and older group (Table 41).

Table 41. Number and proportion of students with no paid employment, 1-5 hours of employment, 6-10 hours or 11 or more hours, per week, by age band. (Chi-squared test, p < 0.001). The figures in brackets represent the percentage of the total, in each age-band, that answered the question.

Hours worked (per week)	Age			Total n (%)
	<20 n (%)	20-24 n (%)	>24 n (%)	
0	69 (86.3)	115 (77.2)	19 (55.9)	203 (77.2)
1-5	8 (10.0)	20 (13.4)	3 (8.8)	31 (11.8)
6-10	1 (1.3)	9 (6.0)	4 (11.8)	14 (5.3)
11 or more	2 (2.5)	5 (3.4)	8 (23.5)	15 (5.7)
Total	80 (100.0)	149 (100.0)	34 (100.0)	263 (100.0)

Students reported similarly low levels of worry about debt to Q1 (Appendix 10.3.6, Table 87, Table 88 and Table 89). Unlike Q1 there was no statistically significant difference between year-groups, though as with Q1, there was a statistically significant difference between age-bands (Kruskal-Wallis test, $p < 0.001$); over-24's scored highest. A score of one was given by three BDS1 students, though they had no debt; they were included in the analysis. Analysis of the "effect of paid work" again observed similar results to Q1 (Appendix 10.3.6, Table 87, Table 88 and Table 89), with a statistically significant difference between age-bands (Kruskal-Wallis test, $p = 0.01$); over-24's scored highest. Despite doing no paid work, 31 BDS1 students and 29 BDS5 students scored a "0" for this question, one BDS1 student scored "2", and one BDS5 student scored each of "1", "2", "3" and "4". A score of "1" was given by one student, though they had left the "number of hours worked" section empty, and one student had circled two answers. The above scores

were all excluded from the analysis. A comment of interest, made in the free-flow text section by a BDS5 student, read: *"I may not be in financial debt, but this is due to massive sacrifice from family – equals emotional burden for myself".*

4.2.2.6 Teaching methods

The analysis of the teaching methods question for year-group observed similar results to Q1 (Appendix 10.3.6, Table 90). Unlike Q1, a significant difference (Mann-Whitney test, $p < 0.001$) between BDS1 and BDS5 was observed for chairside teaching scores. The mean scores for BDS1 and BDS5 were 3.42 ±0.67 and 3.78 ±0.49 respectively (Table 42). A significant difference (Mann-Whitney test, $p = 0.04$) between BDS1 and BDS5 workshop teaching scores was also observed. The mean scores for BDS1 and BDS5 were 2.68 ±0.99 and 2.43 ±1.07 respectively. The analysis by gender showed similar results to Q1, with the exception of lectures, where female scores were significantly higher than males (Mann-Whitney test, $p = 0.01$. Appendix 10.3.6, Table 91). Unlike Q1, there was a statistically significant difference (Kruskal-Wallis test, $p < 0.001$) between age-bands for chairside teaching, though not for online (Kruskal-Wallis test, $p = 0.22$. Appendix 10.3.6, Table 92). In all analyses higher mean scores were observed for workshops than for lectures and online, though lower scores than tutorials and chairside.

Table 42. Chairside and workshop teaching methods, with corresponding mean (SD) and median (min, max) scores and p values for BDS1 and BDS5. A score of 0 = no benefit, 4 = extremely useful. (Mann-Whitney test).

	BDS1		BDS5		p value
	Mean (SD)	Median (min, max)	Mean (SD)	Median (min, max)	
Chairside	3.42 (0.67)	4.00 (2, 4)	3.78 (0.49)	4.00 (1, 4)	<0.001
Workshop	2.68 (0.99)	3.00 (0, 4)	2.43 (1.07)	2.50 (0, 4)	0.04

4.2.2.7 Transition from school to university

The proportion of students taking a gap-year, its influence on progression and students' written comments were similar to Q1 (Appendix 10.3.6, Table 93). The analysis of the "transition to university" questions, observed both genders had lower mean scores for all four questions, compared to Q1, though no statistically significant differences were observed between genders, as with Q1 (Appendix 10.3.6, Table 94). A respondent in BDS1 circled two different answers for the "difference in volume" question and so was excluded from the analysis.

4.2.2.8 BDS5 examination resit questions

The proportion of students in Q2 that did not have to resit any end-of-year examinations was similar to Q1 (65.4%, n = 89, and 66.1%, n = 74 respectively (Table 43). From the 47 that did resit, the majority (80.9% n = 38) involved one resit, but nine students (19.2%) reported resitting more than one examination, similar to the Q1 proportion (23.7%, n = 9).

Table 43. Number and proportion of BDS5 students that had not undertaken any BDS resit examinations, or had undertaken one or more resits. The figures in brackets represent the percentage of the total 136 responses to the question.

Examinations that required resitting	n (%)
None	89 (65.4)
BDS1 only	9 (6.6)
BDS2 only	20 (14.7)
BDS3 only	7 (5.1)
BDS4 only	2 (1.5)
More than one exam	9 (6.6)

In comparison to Q1, the underlying causes contributing to examination failure differed, with five (11.1%) citing "health problems" (compared to 25.7%, n = 9 in Q1) and two (4.4%) "relationship problems" (compared to 19.4%, n = 7 in Q1). As reported for Q1, the cause most commonly reported as contributing to examination failure, by 12 (26.1%), was "family problems" (29.7%, n = 11 in Q1) and least commonly, by two (4.3%), was "financial issues" (2.8%, n = 1 in Q1) (Table 44). The free-flow text comments included those from three students who felt the examinations were unfair: *"...exams are...no reflections on clinical knowledge or ability (90% what we do)".* One individual discussed a lack of support: *"...when I did fail, I was surprised at the lack of support offered to me. I had nowhere to turn...".*

Table 44. Causes contributing to BDS5 students failing a BDS examination: proportion of students scoring a four (indicating a greatly contributing factor). The figures in brackets represent the percentage of the total number of respondents to each contributing cause.

Contributory cause to failing	Number of students scoring this question	Students scoring this question a 4 n (%)
Accommodation issues	47	3 (6.4)
Family problems	46	12 (26.1)
Financial issues	47	2 (4.3)
Health problems	45	5 (11.1)
Learning / teaching issues	46	7 (15.2)
Relationship problems	45	2 (4.4)
Social life	47	3 (6.4)
Lack of study	47	3 (6.4)

The logistic regression analysis of resit cases observed similar findings to Q1, with an odds ratio, of males re-sitting an end-of-year exam, of 1.36 (CI 0.60, 3.07), though this was not statistically significant (p = 0.46) (Appendix 10.3.6, Table 95).

4.2.2.9 Perceived stress scale (PSS)

The Q2 PSS responses were similar to Q1, though the mean score for students living in their own home was lower (18.92 ±8.72 and 21.58 ±6.08 respectively) and those living in "other" accommodation was also lower (17.50 ±4.66 and 21.22 ±10.55 respectively). (Appendix 10.3.6, Table 96 and Table 97).

Compared to Q1, a lower proportion (18.8%, n = 28) of the BDS5 PSS scores were more than two standard deviations higher than the norm values. In the free-flow text section, one students explained: *"...If this q was asked*

before DF1 places had been given and before my hols my stress level scores would have been higher".

4.2.3 Regression analyses

The regression analysis, with PSS results as the response variable, for Q1 and Q2 combined (Table 45) observed females had higher levels of perceived stress than males ($p < 0.0001$), BDS5 higher levels than BDS1 ($p = 0.003$) and students aged 25-and-over, lower levels than under-20's ($p = 0.01$). The students who felt that their journey difficulty was a hindrance to study, had increased PSS scores ($p = 0.01$), as did those that felt family responsibilities ($p = 0.045$), social distractions ($p = 0.04$) and worrying about debt ($p = 0.01$) hindered studies.

Table 45. Multiple regression analysis, with Perceived Stress Scale (PSS) results as the response variable, for Questionnaires 1 and 2 combined.

Predictors	Reference	Coef	p value	95% confidence intervals	
				LCL	UCL
Male	Female	-2.73	<0.0001	-4.05	-1.40
BDS5	BDS1	3.53	0.003	1.23	5.83
Age	<20				
20-24		-0.78	0.48	-2.96	1.40
25-and-over		-4.54	0.01	-7.73	-1.35
Debt (No tuition fees)	No debt				
<£10,000		-1.56	0.07	-3.25	0.12
£10,000-£19,999		0.31	0.81	-2.26	2.88
>=£20,000		-1.24	0.29	-3.54	1.05
Accommodation	Parent home				
Flat share		1.31	0.20	-0.71	3.33
UHR		1.07	0.36	-1.21	3.34
Own / Other		1.53	0.25	-1.10	4.15
Journey difficulty		0.86	0.01	0.23	1.48
Family responsibilities		0.63	0.045	0.01	1.24
Lack of resource		0.55	0.19	-0.27	1.36
Lack of space		0.30	0.37	-0.36	0.96
Noise		0.47	0.13	-0.14	1.07
Social distractions		0.57	0.04	0.04	1.11
Worry about debt		0.80	0.01	0.21	1.38

The multiple regression analysis, with BDS1 and BDS5 examination results as the response variable, for Q1 and Q2 combined (Table 46) observed no statistically significant relationships with any of the predictors.

Table 46. Multiple regression analysis, with BDS1 and BDS5 end-of-year examination results as the response variable, for Questionnaires 1 and 2 combined.

Predictors	Reference	Coef	p value	95% confidence intervals	
				LCL	UCL
Male	Female	-1.27	0.22	-3.30	0.76
PSS score		-0.08	0.31	-0.23	0.07
Journey difficulties		-0.61	0.14	-1.40	0.19
Family responsibilities		-0.17	0.70	-1.06	0.71
Lack of resource		0.22	0.71	-0.94	1.37
Lack of space		0.54	0.28	-0.44	1.52
Noise		-0.31	0.49	-1.21	0.58
Social distractions		-0.77	0.06	-1.58	0.03
Debt worries		-0.16	0.69	-0.96	0.64

The multiple regression analysis with BDS1 examination results as the response variable, for Q1 and Q2 combined, (with transition questions included as predictors), involved a small sample size relative to the number of predictors, necessitating caution in interpretation. Students whose journey difficulty was perceived to be a hindrance to study performed less well in their examinations ($p = 0.047$) (Table 47) and BDS1 students who perceived difficulties in the difficulty /complexity of work between school and university, performed less well in their examinations ($p = 0.01$).

Table 47. Multiple regression analysis for BDS1 (including transition questions as predictors), with BDS1 end-of-year examination results as the response variable, for questionnaires 1 and 2 combined.

Predictors	Reference	Coef	p value	95% confidence intervals	
				LCL	UCL
Male	Female	1.43	0.56	-3.45	6.31
PSS score		-0.18	0.38	-0.60	0.23
Journey difficulties		-2.27	0.047	-4.51	-0.03
Family responsibilities		-2.03	0.14	-4.74	0.69
Lack of resource		1.14	0.33	-1.16	3.64
Lack of space		-0.44	0.70	-2.67	1.79
Noise		0.90	0.38	-1.13	2.94
Social distractions		-1.52	0.12	-3.42	0.38
Debt worries		2.06	0.09	-0.29	4.41
Transition: teaching style change		-0.45	0.76	-3.42	2.51
Transition: work difficulty		-3.89	0.01	-6.82	-0.96
Transition: work volume		0.12	0.94	-2.75	2.99
Transition: move from home		0.86	0.42	-1.25	2.98

4.2.4 UKCAT score, DF1 ranking and BDS5 examination score analyses

4.2.4.1 UKCAT

UKCAT percentile scores (2008 sitting) were obtained for 106 (80.9%) 5-year programme students who sat BDS5 in 2014. The scores ranged from 12 to 99 (median 72), with 53 (50.0%) scoring between the 60th and 79th percentiles, inclusive (Table 48).

Table 48. Range of UKCAT percentile scores achieved by the 5-year and GPEP programme students graduating in 2014

UKCAT percentile	5-year programme Number of students (%)	GPEP programme Number of students (%)
1st to 9th	0 (0.0)	0 (0.0)
10th to 19th	1 (0.9)	0 (0.0)
20th to 29th	0 (0.0)	0 (0.0)
30th to 39th	4 (3.8)	1 (5.0)
40th to 49th	3 (2.8)	5 (25.0)
50th to 59th	8 (7.6)	6 (30.0)
60th to 69th	28 (26.4)	3 (15.0)
70th to 79th	25 (23.6)	2 (10.0)
80th to 89th	20 (18.9)	3 (15.0)
90th to 99th	17 (16.0)	0 (0.0)

UKCAT percentile scores (2009 sitting) were obtained for 20 (80%) of the 25 GPEP students who sat BDS5 in 2014. The scores ranged from 36 to 88 (median 57) with 11 (55.0%) scoring between the 40th and 59th percentile inclusive (Table 48).

4.2.4.2 DF1

DF1 rankings were given by 97 (75.8%) of the 5-year programme students who completed the questionnaire, with a ranking below 400 achieved by 48 (49.5%) (Table 49). DF1 rankings were given by 18 (75.0%) of the GPEP

students completing the questionnaire with a ranking below 400 achieved by 10 (55.6%) (Table 49).

Table 49. Number and proportion of BDS5 students achieving different bands of DF1 rankings.

DF1 ranking	5-year programme Number of students (%)	GPEP pathway Number of students (%)
1 - 200	25 (25.8)	7 (38.9)
201 - 400	23 (23.7)	3 (16.7)
401 - 600	19 (19.6)	4 (22.2)
601 - 800	16 (16.5)	2 (11.1)
801 - 1000	8 (8.3)	0 (0.0)
>1001	6 (6.2)	2 (11.1)

4.2.4.3 BDS5 examination scores

BDS5 “finals” examination percentage scores were obtained for all students who completed a questionnaire, with the exception of one 5-year pathway student, who did not sit the examination. The 5-year pathway scores ranged from 53.0% to 78.8% (median 63.5%) and the GPEPs from 57.0% to 72.8% (median 64.0%). Of the 115 students who gave DF1 rankings, BDS5 percentage scores were obtained for 114 (99.1%).

The BDS5 scores of the best performing 12 (10.5%) students (5-year and GPEP combined) ranged from 70.8% to 78.8% and their DF1 rankings ranged from the 50s to the 700s. The BDS5 scores of the lowest performing 12 (10.5%) students ranged from 53.0% to 58.3% and their DF1 rankings ranged from the 50s to the 1100s.

4.2.4.4 Pearson's correlations between UKCAT, DF1 and BDS5 scores

Of the 106 UKCAT scores obtained for the 5-year programme students, DF1 rankings were provided by 76 (71.7%). No Pearson's correlation (r = -0.03, p = 0.78) was observed between UKCAT scores and DF1 rankings (Figure 9).

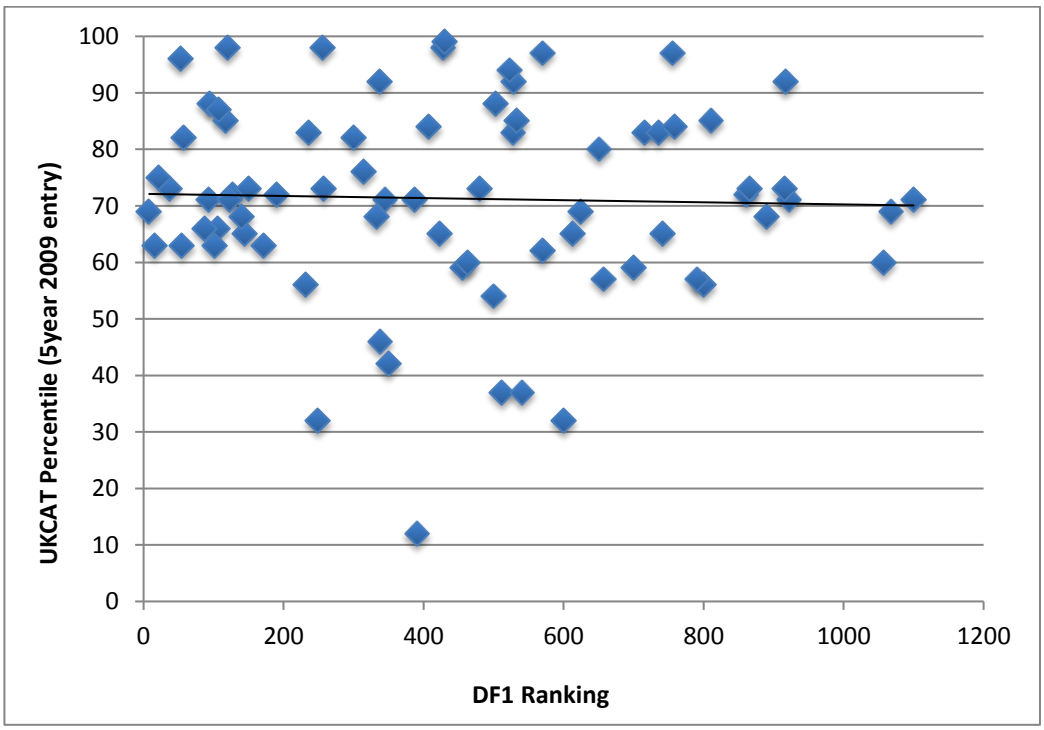

Figure 9. UKCAT percentile vs DF1 ranking for the 5-year programme graduating 2014.

A weak positive Pearson's correlation (r = 0.18, p = 0.06) was observed between UKCAT and BDS5 scores, for the 5-year programme, though this was not statistically significant (Figure 10).

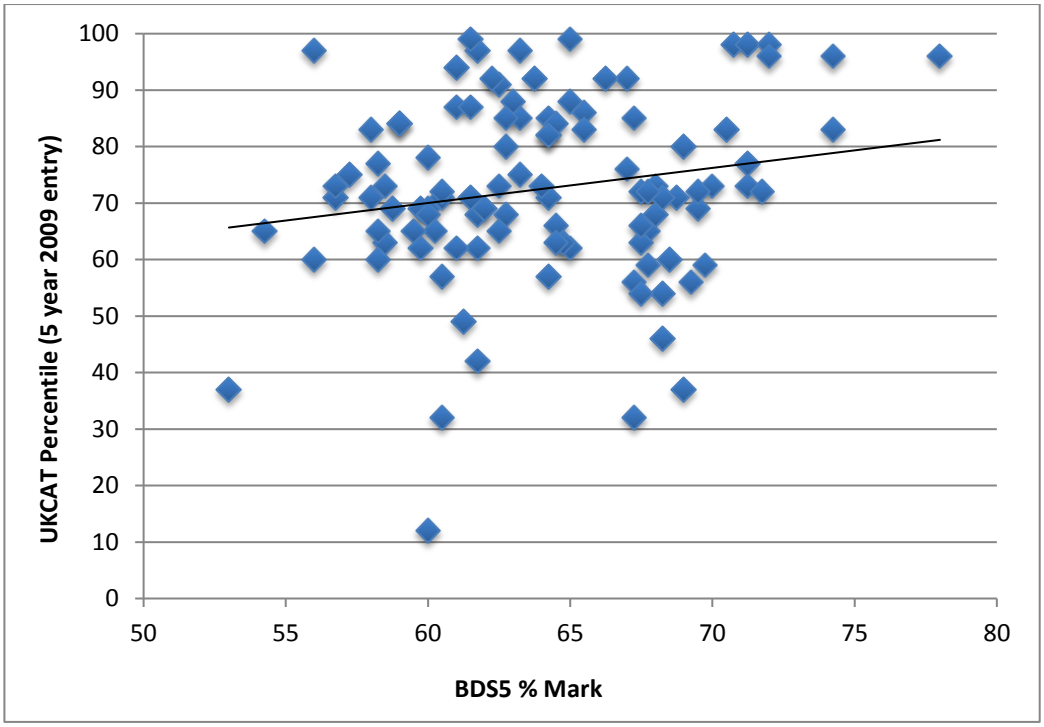

Figure 10. UKCAT percentile vs BDS5 overall (final) score for the 5-year programme graduating 2014.

Of the 20 UKCAT scores obtained for the GPEP students, DF1 rankings were provided by 18 (90%). No correlation (r = +0.06, p = 0.82) was observed between UKCAT scores and DF1 rankings (Appendix 10.3.6, Figure 17). A weak negative correlation (r = -0.18, p = 0.46) was observed between GPEP's UKCAT and BDS5 scores, though this was not statistically significant. Students who performed better at UKCAT performed worse in the BDS5 examination (Appendix 10.3.6, Figure 18).

A weak, statistically significant (r = -0.24, p = 0.01) correlation was observed between DF1 rankings and BDS5 marks (for 5-year programme students and GPEPs combined). Students who performed better at BDS5 also performed

better in the DF1 rankings; as BDS5 scores increased, their DF1 rankings decreased (Figure 11).

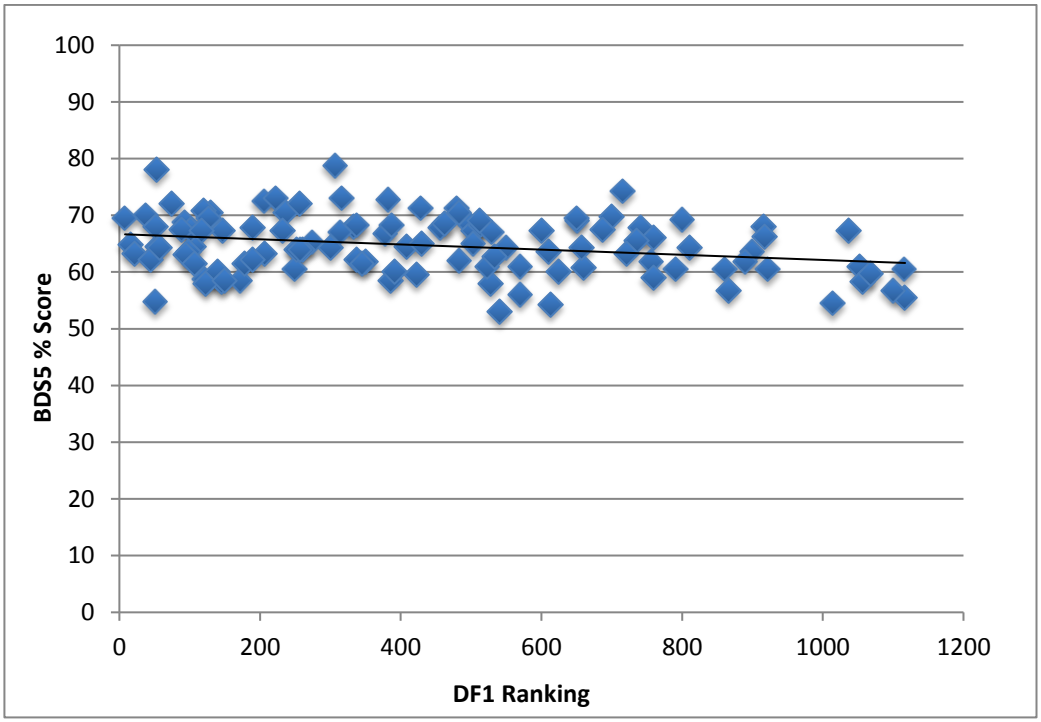

Figure 11. BDS5 overall (final) score vs DF1 ranking for students graduating in 2014.

4.3 Discussion

4.3.1 Outline of main findings

4.3.1.1 Questionnaire 1 (Q1)

Students had high levels of debt, though did not perceive that worrying about this debt significantly affected their studies. Social distractions received the highest score, of the factors related to students' accommodation. The teaching methods rated most highly, were tutorials and chairside, though the BDS1 students found the difference in volume of work between school and university difficult. The majority of BDS5 students progressed without having to resit any end-of-year BDS examinations; those that did resit most commonly cited family and health problems as being a greatly contributory cause. On the whole most students did not appear to be overly concerned by the areas raised in the questionnaire, however for a few individuals this was not the case, with high scores recorded for some questions.

4.3.1.2 Questionnaire 2 (Q2)

The students had similarly high levels of debt, though most did not perceive that worrying about this debt significantly affected their studies. Like the first questionnaire, social distractions was the highest scoring accommodation factor, tutorials and chairside teaching were the teaching methods rated most highly and BDS1 students found the volume of work difficult. The majority of BDS5 students progressed without having to resit any end-of-year BDS examinations. Those that did resit, most commonly cited family problems and teaching and learning issues as being a greatly contributing cause.

A weak correlation was observed between UKCAT scores and BDS5 marks, though this was not statistically significant, and no correlation was observed between UKCAT and DF1. The lack of a strong relationship between the assessments undertaken prior to admission and those taken in final year was unsurprising, as they were designed to test different criteria. A weak, statistically significant correlation was observed between DF1 rankings and BDS5 marks, suggesting the best performing students at BDS5 did not necessarily perform strongest at DF1. The reason for this is unknown, and would warrant further investigation, however different criteria were being assessed, which may offer an explanation.

4.3.1.3 Q1 and Q2 combined regression analyses

Significantly higher perceived stress scores were observed with females, BDS5 students and those who felt journey difficulty, family responsibilities, social distractions and worrying about debt was a hindrance to study. The combined analysis of BDS1 and BDS5 identified no predictors of examination performance. The BDS1 analysis (including the transition from school questions), observed students who struggled with the change in complexity / difficulty of work, performed less well in their end-of-year examinations, as did those whose journey difficulty (commuting to college) was perceived to be a hindrance to study. Although most scores in the questionnaires were low, the perceived stress scores of the students were relatively high. The regression analysis identified some predictors of perceived stress, which may assist future identification of at-risk individuals, who can be offered appropriate pastoral support.

4.3.2 Discussion of method

4.3.2.1 Pilot focus groups

The pilot focus groups and a review of the literature, created the context for the questionnaire. The students participating in the pilots were all in BDS4, because at the time BDS5 students were involved in examinations and BDS1 students were new to the programme.

The pilot focus groups involving GPEPs were conducted separately from those involving the 5-year pathway students, because the nature of their experience was different. The opportunity for students to write anonymous notes, at the end of the session, proved to be a valuable exercise as it allowed them to describe issues that they may have felt uncomfortable discussing in a group setting. Stress was one issue raised in this manner, which resulted in the incorporation of the Perceived Stress Scale within the questionnaire.

4.3.2.2 Questionnaire design

Unique student identifiers were used to compare data, and enabled a degree of triangulation between the interviews and the questionnaires. Using identifiers raises the issue of bias, as students may have been reluctant to answer truthfully if their responses were not anonymous. It was made clear however, in the verbal explanation given prior to distribution, that participants would not be identifiable to anyone other than the principal researcher and that they were under no obligation to complete the questionnaire. Students that had failed an end-of-year examination were of particular interest, as they

had experienced difficulties progressing. Questions were thus incorporated to explore the contributory causes for the failures, enabling commonly occurring causes to be determined.

Many measures of dental student stress have been used in previous studies, including the 38-item Dental Environment Stress (DES) questionnaire, the General Health questionnaire, Beck depression inventory, the Maslach Burnout inventory and the Perceived Stress Scale (Alzahem et al., 2011). The Perceived Stress Scale was chosen for use in this study, as it is quick and straightforward to complete, thus increasing the likelihood of achieving a good participation rate.

4.3.2.3 Pilot questionnaires

The questionnaire was piloted with BDS1 and BDS5 students to determine whether they would complete it as anticipated. The majority of questions were answered in the manner expected, though not in all cases, leading to the editing of some questions. Questions which asked students to rank options were interpreted differently in some cases, with some rating the options rather than ranking them. These questions were re-written using an adjectival scale for the students' responses. The format of the questions was standardised as far as possible, to avoid confusion, with for example the 0-to-4 scale used in the PSS section also used for several of the other questions.

The pilot incorporated the 14-item PSS (PSS14) however it was decided to use the 10-item PSS (PSS10) in the refined questionnaire. The rationale for this was that the PSS10 has been shown to have better internal reliability than PSS14 and its use recommended over the PSS14 (Cohen & Williamson, 1988). The questionnaire was also simplified as a result of using PSS10, thus reducing the time required to complete it. The teaching method questions were also simplified, by combining the three online options to just one.

An interesting finding was that students stated they would be more likely to complete the questionnaire in a paper format that an online version. The reasons for this were not made clear, though students often complain about the large volume of online communications they receive and it is possible that an online questionnaire would simply have been ignored or overlooked. This finding was similar to the results of a meta-analysis conducted by Shih & Fan (2009) of 35 studies, which observed e-mail surveys to have a lower response than mail surveys, though they did find that this difference was negligible in college populations. Similarly, Murphy et al. (2004) had a response rate of 15% following an electronic mailing to American dental students, which increased to 46.2% when a paper version was distributed. Youngson et al. (2008) reported a response rate of about 100% during the first year of their study, when questionnaires were distributed in the presence of the primary investigator. The response rate dropped however to approximately 50% when e-mail circulation was used during the two subsequent years.

4.3.2.4 Rationale for the case selection

The BDS1 and BDS5 years were chosen to complete the questionnaire, as these groups were at the beginning and end of their training and so differences and similarities could be sought. The greatest proportion of students that leave the programme tend to do so at the end of BDS1 and so analysing this group was of particular relevance. The BDS1 cohort had potentially unique progression issues, such as leaving home for the first time and experiencing a different academic environment (Pittman & Richmond, 2008). The BDS5 cohort by contrast were in their final year of studies and were thus in a position to consider all the factors that had influenced their progression as a dental undergraduate. It would have been interesting to have administered questionnaires to all the year groups, BDS1, BDS2, BDS3, BDS4 and BDS5, however this would have been unmanageable within the context of this project, due to the volume of data that would have been generated.

4.3.2.5 Questionnaire distribution

The questionnaire distribution was carefully timed to avoid busy or particularly stressful times for the students, for example examination periods, which occurred during the Autumn term and between April and June. The Autumn term was also considered too early, as BDS1 students had only joined the University in September, and BDS5 were involved in preparation for DF1 interviews. The beginning of the Spring term was thus selected, being a relatively quiet period. Q2 was undertaken at the same time during the following academic year, 2013-2014.

It is a reasonable assumption that many results would not change significantly had the timing of the questionnaire been different, however, it is feasible that the PSS scores may have been higher had the distribution been carried out nearer an examination period. The debt levels are likely to have increased had the questionnaire been conducted later in the term, however such increases would have been of a similar magnitude for all students, ensuring the analyses undertaken remained valid.

4.3.2.6 Profile of those students not given / not completing the questionnaire

The improved outcome of the second questionnaire was probably due to the nature of the teaching session used and timing of the distribution. In the case of BDS1 for example, Q1 was given at the end of a teaching session when students may have wished to leave promptly, as opposed to Q2 which was distributed at the start of a lecture. The number of students given the questionnaire, but failing to complete it, was lower for Q2, possibly due to an improved explanation given by the principal researcher about the relevance to students of the study. Failure to receive the questionnaire, or refusal to participate, may lead to non-response bias (Denscombe, 2010). Individuals that did not complete the questionnaire were thus compared to those that did and no obvious differences were observed. The non-responders were both male and female, GPEPs and non-GPEPs and from a mixture of different teaching groups. The respondents can thus be considered representative of the whole BDS1 and BDS5 cohort.

4.3.3 Discussion of Questionnaire 1 results

4.3.3.1 Demographic data

Parashos et al. (2005) reported that it is probably not possible to specify what constitutes an adequate questionnaire response rate, being dependent upon the nature of the population surveyed, however they cite a number of papers which give a range of 70-80%. The response rates of 83.0% for the BDS1 questionnaire and 82.9% for the BDS5 questionnaire could thus be considered acceptable, which was important as it reduced the chance of non-response bias (Shih & Fan, 2009). The proportion of questionnaires completed by male students was similar to the proportion of male students in the year group as a whole, and similarly for females.

University halls of residence (UHR) were the accommodation type of 43.0% of BDS1 respondents, with similar proportions (40.2%) living in the parental home, which was not surprising considering the high cost of living in Central London. The smaller proportion (11.2%) living in flat-shares was expected, due to the high cost of rentals, but also because many BDS1 students would not have had time to develop the social friendships required to set up flat-shares. The majority of BDS5 students, by contrast, lived in a student flat-share, though a large proportion (34.2%) lived in their parental home. Questioning conducted during the interview phase of this research project, established that many students elected to return to the parental home during their final year, to avoid distractions such as cooking and cleaning, thus assisting their studies. The large number of BDS1 students living in parental homes has potential significance to their transition process, as discussed in

the literature review. Buote et al. (2007) observed that students living in residence had twice as many new friends, during their first year at university, than those commuting from home and Wilcox et al. (2005) observed the strongest friendships were made between individuals that lived together.

A sizeable proportion of students already had a degree, 14.0% in BDS1 and 28.1% in BDS5. The higher number seen in BDS5 was due to the entry of GPEPs into BDS2. The individuals in possession of a degree would be expected to differ somewhat from most of their peers with no degree, being older and potentially having greater responsibilities such as home ownership and families to support. It was for this reason that the questionnaire analyses included age-band comparisons. During the focus group stage, the GPEP cohort was also interviewed separately from students on the 5-year pathway. The students with a prior degree, on the 5-year programme, had a different undergraduate experience, compared to the GPEPs, as they undertook the BDS1 year. They were thus analysed with the 5-year cohort rather than the GPEP one.

4.3.3.2 Accommodation questions

The series of questions asking students to rate the extent to which factors related to accommodation hindered their ability to study effectively, observed social distractions to be the highest scoring factor, with approximately 1/5 of students rating this a 4 (a “significant hindrance to studies”). The BDS5 students scored higher than BDS1 students, which was a little surprising as

first year university students tend to have the reputation of spending considerable time socialising, though the finding was not statistically significant. It is possible the finding may be due to the majority of BDS5 students living in house-shares, which might offer more opportunity for socialising, as they would have expanded social networks. Somewhat contradicting these findings, Kearns & Gardiner (2007) observed no relationship between the avoidance of interruptions and distractions and students' perceived effectiveness at work. The difference in accommodation type may also account for the BDS5 students scoring significantly higher than BDS1 on the lack of space to work question, with house shares in Central London potentially having less available space than for example parental homes or university halls.

The difficulty with journey question, for the over-24 year-old age group, received the highest mean scores after social distractions, with a statistically significant difference found between the age-bands. This older age-band included a greater proportion of students who owned their own home, with potentially a long commute to university, as opposed to younger students, many of whom lived in university halls situated within Central London. The finding is of interest as a relationship between drop-out rate of students from medical school and living off campus has been shown by Arulampalam et al. (2007).

4.3.3.3 Finance questions

The BDS5 students, on the 5-year pathway, paid annual tuition fees of £3145, when they started their training in 2008 (personal communication, KCLDI Academic Centre), whereas the BDS1 students, who started their training in 2012, paid fees of £9000. It was thus decided to ask students their levels of debt both with and without tuition fees. There were significant associations between debt levels for BDS1 and BDS5 and between different age bands as would be expected, as BDS1 students (who also comprised the under-20 year-old age group) had only just started their programmes. No difference in debt was observed between gender, again which was to be expected. A large proportion of BDS5 students (67.2%) had debts, including tuition fees, of £20,000 or over, which was of concern though unsurprising, following five years of study in Central London. This was is in agreement with the figures reported in the 2013 British Dental Association survey (Kemp & Edwards, 2014).

The "worry about debt" question was included in the questionnaire, to explore the observation of Ross et al. (2006) who reported that medical students worried about money and so under performed in their degree examinations. It was interesting that most KCLDI students did not associate their debt with worry about their studies, with low mean scores for both year groups, though BDS5 scored significantly higher than BDS1. The over-25 year-old age group scored highest for this question, with a median of 2.00, which is probably due to this group having greater commitments as it includes many of the GPEPs who may have had debts remaining from their

previous degree. Though the median scores were low, 6.5% of BDS1 and 9.1% of BDS5 scored a 4 (a “significant effect on my studies”). This observation highlighted finance to be a considerable barrier to progression for some and the need for awareness of differences in students’ individual circumstances. It also demonstrated the relevance of the qualitative strand of this research, where individuals’ circumstances were explored in-depth.

4.3.3.4 Teaching methods

Students were asked to rate different teaching methods from 0 to 4, with 4 being “I find this method extremely useful”. Chairside teaching scored highest, which was unsurprising given the practical nature of dentistry. The finding supports the results from Davies et al. (2009) in a questionnaire based study on dental graduates, reflecting on their time spent in a simulated general dental practice environment, who rated their learning experiences highly.

The two students that circled “0-4” next to lecture and tutorial teaching, and made the comment “depending”, were probably implying that the usefulness of the teaching was dependent upon the quality of the session. This is a valid observation, however the results still provide the overall perception students have of the teaching methods. The online results were of interest as they were the only teaching method that gave a statistically significant result, both between year groups and age bands, with BDS1 students and younger students scoring higher. The BDS1 course involves predominantly academic

study, delivered mainly using lectures and online material, whereas BDS5 comprises predominantly clinical work, which would explain these findings.

4.3.3.5 Transition from school to university (BDS1 respondents only)

The BDS1 were asked to reflect on their transition from school. These students had relatively high scores for the three questions related to difference in teaching and work between school and university, with volume of work scoring highest, a mean score of 3.06 and 3.25 for females and males respectively. These high scores raise concern, as a score of 4 indicated “caused me great difficulties”. Busato et al. (2000) noted that a heavy workload may be associated with students adopting a surface learning approach, which in turn has been associated with decreased academic performance (Duff et al., 2004). A new curriculum is being introduced at KCLDI, with the potential to address some of these workload concerns; the inclusion of organisational and time-management workshops would be advantageous. Kearns & Gardiner (2007) in their questionnaire based study, observed the most important time management behaviour involved students having a clear goal and purpose, followed by careful planning and prioritisation of tasks.

The 55 individuals who answered the question about moving from the parental home, did not appear to find the move too difficult. It could be argued that those students likely to find such a move very difficult would remain within the home and commute to university, thus reducing the validity

of this question somewhat. Students' comments, that taking a gap-year resulted in an increased level of maturity, were similar to those made during the interviews conducted by King (2011), where increased confidence, maturity and independence were described as benefits gained.

4.3.3.6 End-of-year examination resits (BDS5 respondents only)

The BDS1 students had not sat any end-of-year examinations and so only BDS5 students were eligible to answer this question. A relatively high proportion (33.9%) of students had been required to re-sit at least one examination, with BDS4 being the year that resulted in the greatest number or resits. The students were asked to rate eight possible contributory factors associated with examination failure, on a scale from 0 to 4, with 4 indicating a greatly contributing reason. This section was completed in an unexpected manner. Instead of students providing a single rating for each factor, for example, two individuals circled two responses to the same question, and it was thus decided to calculate the number of "4s" each contributory factor received. "Family problems" received the greatest number of "4s" (29.7% of respondents, n = 11) with "health problems" also cited by nine (25.7%). This observation contrasted that of Todres et al. (2012), who failed to establish a link between the need for UK medical students to re-sit examinations and health, money or other social factors. A large proportion of students lived in the parental home and it is possible that these individuals were faced with unique family pressures and commitments not experienced by those living, for example, in student house-shares.

It was interesting that only one student scored “financial issues” a four. This result confirms the observation that students did not appear to feel that worry about debt affected their studies.

The result for “social life” was also interesting, with five (13.5%) students scoring a four. A higher proportion of students would have been expected to have rated social distractions as a cause, as this was a factor identified in the questionnaire as being perceived to hinder studies. This apparent discrepancy can perhaps be explained by students’ ability to manage their social life effectively, such that they did not allow it to hinder studies to the extent that it affected examination performance.

The re-sit students obviously had difficulties in terms of progression, and so were of particular interest. The focus group and one-to-one interview strand of this project involved the participation of some of these students, enabling detailed questioning on the causative factors to be undertaken.

4.3.3.7 Perceived stress scale

The Cronbach alpha value of 0.87 indicated that the use of the PSS within the questionnaire was a reliable measure of the levels of perceived stress within the population sampled. The significantly higher PSS scores of females than males supported the findings of other work (Alzahem et al., 2011, Linn & Zeppa, 1984 and Shah et al., 2010) however the magnitude of the scores was of concern. The mean PSS scores observed in this work

were 20.2 (±6.6) for females and 16.9 (±7.3) for males, which were notably higher than the norm values for the general population of America, of 16.1 (±7.6) and 15.5 (±7.4) respectively (Cohen & Janicki-Deverts, 2012). The high values obtained could be explained by the demanding nature of the dental programme, though they were higher than the means of 16.7 (females) and 15.6 (males), observed by Silverstein & Kritz-Silverstein (2010) in their work on first-year American dental students. The large number of individuals that had PSS scores greater than one standard deviation higher than the norm values, quoted by Cohen (1994), were also worrying, with almost one quarter (24.6%, n = 29) of BDS5 students having values over two standard deviations higher. These individuals were sent an e-mail by the principal researcher, advising them of counselling services and offering to discuss the findings further with them. Interestingly, several students replied to explain that they had already sought such help.

The BDS5 students' mean score of 20.2 (±7.6) was significantly higher than the BDS1 score of 17.5 (±6.2) and possibly explained by the nature of the final year of study, which involved much pressure to achieve clinical requirements, preparation for examinations and concern about DF1 posts.

4.3.3.8 Free-flow text

The free-flow text generated interesting and relevant information. Travel time was raised by several BDS1 students, which led to an additional question being included in the second questionnaire. The comments concerning lack

of practice examination questions and uncertainty about depth of study required, were also raised during the interview stage thus helping to provide triangulation. A lack of heating in student accommodation, causing difficulties with study, was mentioned by some, in both BDS1 and BDS5. The timing of the survey, conducted during the cold winter months, may have led to some bias in this regard. A possible alternative explanation for this finding, is that students are struggling to afford accommodation of adequate quality, or simply unable to afford to pay for heating.

4.3.4 Discussion of Questionnaire 2, with comparisons to Questionnaire 1.

4.3.4.1 Refinements made to questionnaire

The questionnaire was repeated, to enable comparisons between the cohorts to be made. But additional questions were added, as the results from the first questionnaire, focus groups and interviews highlighted further areas that impacted upon progression, such as journey time. Individuals that had taken a prior degree were asked further details, such as the subject area of the degree and the extent to which, if at all, it helped progression. Similarly, students were asked to rate workshops, in addition to the other teaching methods, and International students were identified. The BDS5 students were asked to provide their Dental Foundation Training Year One (DFT1) interview ranking. This gave an opportunity to establish whether there was any relationship between the national ranking and how students performed at the BDS5 examinations.

4.3.4.2 Demographic data

The response rate was very good and higher than Questionnaire 1 (Q1). Most of the demographic findings were similar to Q1. University halls of residence were the accommodation more commonly occupied by BDS1 (58.0%, n = 65) and higher than that observed in Q1 (43.0%, n = 46). Similarly, the proportion living in parental homes was lower in Questionnaire 2 (Q2). There is no obvious explanation for these differences. It might have been expected that increased tuition fees (£9,000) would have increased the proportion of BDS1 living at home, but this was not seen.

4.3.4.3 Accommodation questions

Unlike Q1, Q2 students were asked the length of their journey time to university. It was interesting that 17.2% (n = 11) of BDS1 females spent over two hours each day travelling to and from university, compared to only 6.3% (n = 3) of males, which may be related to the higher proportion of females that lived in the parental home (31.1% compared to 23.0% of males). In the mixed-methods study conducted by Holdsworth (2006) a journey time of over 30 minutes was associated with students enjoying their social life less and having a reduced ability to make friends. Despite this considerable journey time, the scores for the "journey being a hindrance to study" question remained low, with no significant association between gender. A possible explanation for the low scores was given during the interviews, which established that some students were able to use long journeys in a constructive manner to undertake study.

A conflicting result was obtained between Q1 and Q2 for the “lack of space to work” question, with BDS5 finding it significantly more of a hindrance than BDS1 in Q1 ($p = 0.03$) and BDS1 finding it more of a hindrance in Q2 ($p = 0.046$). The reason for the difference may be related to the greater proportion of BDS1 students living in the parental home in Q1 (40.2%) compared to Q2 (24.1%), though the actual scores recorded were similar. A further difference between Q1 and Q2 was that some comparisons between year-groups and between age-bands observed statistically significant differences on one questionnaire but not on the other. Despite this, the actual scores recorded were similar between the two questionnaires.

4.3.4.4 Finance questions

Compared to Q1, a higher proportion of BDS5 students had no debt (excluding tuition fees) possibly due to a greater number of individuals having undertaken part-time work during their studies or receiving financial help from parents. The proportion of BDS1 students with no debt (excluding tuition fees) dropped between Q1 and Q2, which may feasibly be due, in part, to a change in attitude following the introduction of the £9,000 tuition fee. Students may be becoming resigned to the prospect of large debts and consequently are less frugal. The significant association between gender and debt levels (excluding tuition fees) in Q2 was not observed in Q1. A possible explanation for this gender difference was that a greater proportion of males in Q2 undertook paid work, thus reducing their levels of debt. The questionnaire only surveyed BDS1 and BDS5 students, and it became apparent during the interviews that employment is more commonly sought

during BDS2, BDS3 and BDS4, with BDS5 students tending to stop paid work to concentrate on their final examinations. Unlike Q1, a significant association existed between age-bands in Q2 for the number of hours spent in paid employment, however the numbers involved in paid work were relatively low, which may explain the statistical differences.

The three students in Q1 and three in Q2 that scored the “worry about debt” question (despite having no debt) were included in the analysis. The logic, for inclusion was that students were possibly worried about the prospect of falling into debt in the future.

4.3.4.5 Teaching methods

Some comparisons between year-groups, gender and age-bands observed a statistically significant difference on one questionnaire but not on the other. Despite this, the actual scores recorded were similar between the two questionnaires. Workshops were added to the list of teaching methods in Q2, and their relative popularity was unsurprising, as workshops tend to involve relatively small groups, similar to tutorials.

4.3.4.6 End-of-year examination resits (BDS5 respondents only)

The contributory factors necessitating an end-of-year examination resit varied between Q1 and Q2, with the only factor scoring highly on both being “family problems”. This demonstrated the importance of having a strong pastoral support system and will be discussed further in Section 5.3.8.3. The

low scores for “financial issues” supported the observation that students do not appear to feel financial issues are causing problems with their study.

4.3.4.7 Perceived stress scale (PSS)

The PSS scores were slightly lower than in Q1, however remained greater than the norm values for males and females given by Cohen (1994); 18.8% (n = 28) of BDS5 respondents had values more than two standard deviations higher (compared to 24.6% (n = 29) for Q1). The high levels of perceived stress are a concern and will be discussed further in Section 5.3.8.6.

4.3.4.8 Combined multiple regression analyses

In undertaking the multiple regression analyses, it was decided to combine the results of Q1 and Q2, thus producing a larger data set and increasing the validity of the findings. The analysis, with PSS results as the response variable, observed a number of significant predictors of increased PSS score, none of which were particularly surprising. These predictors included being female and being younger, both of which were in agreement with the PSS10 results obtained during three American national surveys (Cohen & Janicki-Deverts, 2012). Higher levels of stress have similarly been reported, in females, by Alzahem et al. (2011), Linn & Zeppa (1984) and Shah et al. (2010). Increased worry about debt was also a significant predictor, in agreement with Silverstein & Kritz-Silverstein (2010) who established financial worries as being significant stressors.

The lack of any significant predictors, with BDS1 and BDS5 examination results as the response variable, was interesting, though social distractions approached significance ($p = 0.06$) and underlined the relevance of exploring the nature of these distractions during the interview phase. Stress was not a significant predictor of academic performance, in agreement with Ross et al. (2006) and Stewart et al. (1999) who failed to find a significant relationship in the case of medical students. Similarly, Sanders & Lushington (2002) found only a weak association in Australian dental students, though Silverstein & Kritz-Silverstein (2010) and Shah et al. (2010) reported that student academic performance decreased as stress scores increased. Ross et al. (2006) found medical students who worried about money, performed less well; this observation was not replicated with the KCLDI students. The apparent lack of concern about debt was explored further during the interview strand, and is discussed in Section 5.3.8.5.

The regression analysis with BDS1 examination results as the response variable (and transition questions included as predictors), involved a smaller sample size than the other two analyses and the results needed treating with a little caution. The observation that journey difficulty predicted BDS1 examination results was interesting, as many students undertake long daily commutes to university. The study conducted by Holdsworth (2006) at four UK higher education institutions, showed that students living at home, with a journey time of over 30 minutes, had a reduced ability to make friends. This may possibly result in reduced opportunities for peer support and peer learning with a detrimental effect on performance. Students who experienced

transition difficulties as a result of the difficulty /complexity of work performed less well and an interesting follow-up would be to determine whether these individuals had anything in common, such as nature of school attended or A-level subjects studied. McManus et al. (2013b) observed that even small decreases in A-level examination scores equated to decreased performance in year-one medical examinations; it is feasible that students experiencing difficulties with complexity of year one work performed less well in A-level examinations compared to their high-performing peers.

4.3.4.9 Free-flow text

Travel time was a common theme. A significant number of students lived with parents on the outskirts of London, necessitating long journeys, with many student house-shares also some distance away, due to cheaper rents. Students could study in the library and then return home later, however this is not practical for some due to safety worries. The safety issues raised by three students, was of concern and possibly related to the affordability of accommodation. It is thus possible that financial issues may be playing an indirect “hidden” role on progression, in terms of the nature of the accommodation that is affordable. In September 2015, the average monthly cost of private sector rents in London were over twice the national average, at £1,555, having increased 6.6% compared to 12 months earlier (HomeLet, 2015).

Unlike Q1, the Q2 students that had undertaken a previous degree were asked their views on the experience. Many explained the degree was of little

help academically, depending on subject area, however benefits gained included confidence, maturity and communication skills. The finding was unsurprising and is in agreement with the observation of Wilkinson et al. (2004) that improved assertiveness and motivation were associated with possession of a previous degree. However, the greater maturity of these individuals, compared to school leavers, highlights the possible need for a different approach when considering their welfare needs. The resitting students' concerns about examination fairness, and lack of university support received, following failure, provided triangulation for the interview phase, which raised similar issues. Student comments that PSS scores would have been higher, had the questionnaire been administered earlier, supported the timing of its distribution, though increase further the concern raised by the high scores.

4.3.4.10 UKCAT scores, DF1 ranking and BDS5 examination score

The similar BDS5 examination scores observed for 5-year programme and GPEP students (medians of 63.5% and 64.0% respectively) was interesting, as the backgrounds of these two cohorts differed considerably, as previously discussed. The weak correlation between 5-year programme students' UK Clinical Aptitude Test (UKCAT) score and the BDS5 examination score, was similar to the findings of Sartania et al. (2014), Husbands et al. (2014) and Tiffin et al. (2016) who observed UKCAT to predict final year performance at medical school. Interestingly in this study, the opposite was observed for the GPEP students, where increased UKCAT scores were associated with decreased performance in BDS5, though the correlation was weak and, for

both 5-year and GPEP students, not statistically significant. Reliability was reduced due to the small number of individuals analysed, however the finding was unsurprising as the UKCAT carries “less weight” during the KCLDI selection process for GPEPs than 5-year programme students. As a result, individuals may be accepted on to the GPEP pathway having performed relatively poorly at the UKCAT, but then progress to perform strongly in the BDS5 examination. By contrast, Foley and Hijazi (2015) reported a positive correlation between UKCAT scores and summative assessments for graduate-entry dental students at Aberdeen Dental School. The admissions criteria at Aberdeen may possibly account for this difference, with higher UKCAT scores required. The lack of correlation between UKCAT scores and DF1 scores, for both 5-year and GPEP students, was unsurprising. UKCAT is used in conjunction with other university admissions information, to select individuals who would make suitable dentists, rather than testing the skills required to become a general dental practitioner.

KCLDI students who intend to join a NHS Performers List are required to undertake dental foundation training (DFT, 2015) and thus some will not have undertaken the DFT interview process if not intending to work within the NHS, for example International students. DFT rankings were not provided by 37 (24%) students. It is possible that some of these individuals may have been reluctant to disclose their ranking due to poor performance, thus potentially introducing some bias to the correlation findings.

The analysis of the DFT interview rankings observed that some students who performed very well in the process, performed poorly at BDS5 and vice-versa. This was unsurprising however, as the two processes were not identical. The BDS5 examination was predominantly testing the academic knowledge required to become a dentist, as detailed in Section 3.3.2, whereas the DFT interview placed more emphasis on the general dental practice environment, such as NHS governance issues. In addition, the question setting and marking processes may have differed. As the majority of graduates intend to join a NHS Performers List, a stronger correlation between the BDS5 examination scores and DF1 rankings would arguably be desirable, if the intention is that the best performing undergraduates should secure their training practice of first choice.

A recommendation would be to further investigate this area, and a piece of ongoing work involves seeking BDS5 students' views regarding the admissions process, including UKCAT, and the DFT interview process.

4.3.5 Summary

The exploration of factors influencing student progression, using a largely quantitative approach, resulted in the identification of many such factors, as outlined in Section 4.3.1 above. The following strand explores these areas in greater depth using a qualitative approach, involving focus groups and interviews.

5 Chapter 5. Focus groups and one-to-one interviews

5.1 Methods

5.1.1 Topic guides

The findings of the pilot focus group discussions informed the content for the topic guides in the one-to-one interviews and focus groups (Appendix 10.4.1). A sequential design was used, whereby the results of the questionnaire informed the focus group discussion and the focus group discussion informed the one-to-one interviews (Guest et al., 2012).

5.1.2 Focus groups 1 and one-to-one interviews 1 (2012-2013 academic year)

5.1.2.1 Eligibility

All students in BDS1 (C5) and BDS5 (C2 and C4), during the 2012-2013 academic year, were invited to participate in the study, with the exception of those on the Dentistry Entry Pathway for Medical Graduates (DPMG). The DPMG students were excluded for the reasons detailed in Section 4.1.4.1.

5.1.2.2 Focus groups 1

An e-mail was sent in March 2013 by KCLDI Academic Centre, to all eligible participants, inviting them to participate in a focus group, with a follow-up e-mail sent two weeks later. In addition, those students who had indicated an interest in participating, by means of the tick-box on the questionnaire, were contacted personally by e-mail. The students that responded were e-mailed an information sheet detailing the nature of the focus group, with all that wished to participate then invited to one of the groups. Students received no

payment for participating, though were offered snacks and drink during the interview.

Segmentation was undertaken (Cousin, 2009) with the BDS1 students interviewed separately from the BDS5 students and the BDS5 graduate entry programme (GPEP) students separately from the BDS5 students on the 5-year pathway. The reason for this was that the factors affecting BDS1 progression were likely to differ from those affecting BDS5 progression and similarly with the GPEPs and 5-year pathway students.

The intention was to have a minimum group size of four and a maximum of 12 (Cousin, 2009) though the minimum number was determined by availability of participants.

The BDS1 (C5) focus groups were planned for March/April and the BDS5 (C2 and C4) for April/May. Care was taken to avoid examination periods and to identify a time convenient to the students. All focus groups were conducted in a private room on the university campus, thus ensuring confidentiality and convenience.

A verbal explanation of the nature of the focus group was given to the participants and each received a paper copy of the information sheet. It was emphasised that participation was voluntary and that they were free to leave the interview at any time. Students willing to continue then completed a consent form. Participants were allocated an identifying letter (A, B, C etc) to

help the interviewer identify individuals during the transcription process. Each participant completed a brief questionnaire to establish their age, gender and whether they had failed any end-of-year examinations. This enabled the demographic profile of the group to be established.

Ground rules were established (Cousin, 2009) with participants, for example, asked to respect any differing opinions, to try and avoid talking over each other and for the interviews to remain confidential. Participants were given a short period of time to compose their thoughts and make some notes on a piece of paper, prior to commencing the interview. A digital voice recorder was then switched on and the initial question read out by the moderator. The BDS1 students were asked “can you comment on any factors that you are aware of that have affected progression of students through this first year of the course?” and the BDS5 students asked “can you comment on any factors that you are aware of that have affected progression of students through their dental course?”

The moderator aimed to be non-intrusive (Bryman, 2004) and to allow a free-flowing discussion, though if necessary intervened if the conversation appeared to be losing relevance or to pose a supplementary question, as outlined in the topic guide. The discussion continued until the topics had been exhausted or the participants had to leave. On occasion the moderator terminated the interview if it was felt that it was becoming too lengthy or no new topics were emerging. Field notes were taken during the interviews and

upon completion, notes summarising the process were made. The principal researcher was the moderator for all the focus groups.

5.1.2.3 One-to-one interviews 1

Recruitment to the one-to-one interviews took place in May 2013 and was an identical process to that used for the focus groups. All students that wished to participate in a one-to-one interview were invited to do so, with none excluded. The interviews were conducted in May and June, in a private room on the university campus, having obtained written consent. The interviews were of a semi-structured nature, with a topic guide (Appendix 10.4.1) and a digital audio recorder used. The principal researcher conducted all the interviews.

5.1.2.4 Transcription

The focus group and one-to-one interviews were transcribed verbatim, including all “ums and errs”, stuttering, repetition and the noting of pauses. The process was solely undertaken by the principal researcher, ensuring consistency in approach and allowing immersion in the data. Field notes were consulted, and where applicable a record made in the transcribed document of any relevant observations, such as hand gestures. The notes were also used to help identify participants if necessary. The transcriptions were anonymised to ensure confidentiality of both the participants and any individuals discussed.

5.1.2.5 Analysis

Thematic analysis was used to identify patterns within the transcribed data (Clarke & Braun, 2013). The six phases of thematic analysis, outlined by Braun & Clarke (2006) were followed.

The transcribed interviews were read several times by the principal investigator to gain complete familiarisation with the content (phase one). The transcribed texts were then entered into NVivo 10 for Windows software (QSR International Pty Ltd, Australia) and the initial coding undertaken by the principal investigator (phase two). A coding book was compiled, giving a description for each code and reasons for using or not using them (Guest et al., 2012). A combination of both inductive and deductive coding was used (Guest et al., 2012) and a code was given for each individual participant, to enable analysis of every person's contributions and of group dynamics (Bryman, 2004). The text was segmented in such a way that the meaning of each segment was not lost when removed from the main body of text (Guest et al., 2012). Following completion of the initial coding, the coding of all interviews was then re-checked. This increased reliability by ensuring, for example, that codes generated at a later stage in the analysis were also applied to the interviews coded earlier.

The resulting codes were condensed into a smaller number of parent codes and themes sought based on the degree of repetition (phase three). The NVivo software was used to quantify the incidence of each code, assisting the identification of themes. The coding process was checked by a second

individual, who also assisted with theme-identification, thus increasing transparency and reducing the potential for bias.

The themes were reviewed to ensure they were relevant (phase four). The analysis tools within the NVivo software were used to ensure that the coded segments within each theme were relevant to that theme. The themes were then honed further, with a clear definition for each theme determined and a name given (phase five). The transcribed documents were searched for interesting quotations, which would illustrate the themes and the relevance of these themes to the answering of the research question (phase six). A log book was compiled to record the decision making process.

5.1.3 Focus groups and one-to-one interviews 2 (2013-2014 academic year)

5.1.3.1 Rationale for undertaking a second set of interviews

A decision was made to repeat the focus groups and one-to-one interviews with a second group of students, those in BDS1 (C6) and BDS5 (C7 and C8) during the 2013-2014 academic year. The rationale was to ensure saturation of data was achieved. All students in BDS 1 and BDS 5, during the 2013-2014 academic year, were eligible to participate in the study, with the exception of the DPMGs, as above.

The recruitment, sampling and interview process were identical to the first set of interviews. The timing differed slightly, as the interview process was started slightly earlier with the intention of recruiting more participants. The principal interviewer transcribed all interviews and followed the previously

reported approach, with the exception that “ums and errs” stuttering and repetition of words were not transcribed verbatim.

5.2 Results

5.2.1 Overview

The recruitment e-mails were sent to 554 individuals; 129 BDS1 and 146 BDS5 students in the 2012/13 academic year (C2, C4, C5) and 122 BDS1 and 157 BDS5 students in in the 2013/14 academic year (C6, C7, C8). A total of 26 focus groups and interviews were conducted, 10 involving BDS1 students and 16 with BDS5. The sessions comprised 55 different individuals and resulted in 20 hours 28 minutes of audio recording (Table 50).

Table 50. Number of BDS1 and BDS5 focus groups and one-to-one interviews conducted, number of participants and length of interviews, for both the 2012/13 and 2013/14 academic years.

	2012/13 academic year	2013/14 academic year	Totals
No of BDS1 interviews / focus groups	2 (C5)	8 (C6)	10
No of BDS5 interviews / focus groups	9 (C2, C4)	7 (C7, C8)	16
No of different participants	24	31	55
Length of interviews	6 hours 51 minutes	13 hours 37 minutes	20 hours 28 minutes

5.2.2 Demographic details

5.2.2.1 Focus groups 1 (2012/13 academic year)

A total of four focus groups were conducted during 2012/13, comprising one group with seven BDS1 students, two groups of 5-year pathway students (with three and six participants), and one GPEP group (with five participants) (Table 51). A total of 12 male and 9 female students were interviewed, with an age range of 18 to over-30 and four also participated in one-to-one interviews. Seven students had failed an end-of-year BDS examination (including one who failed BDS5 shortly after the focus group was conducted). The total recording time was three hours 30 minutes.

Table 51. Gender, age range and other known factors, related to the students that participated in the focus groups during the 2012/13 academic year. The Perceived Stress Scale (PSS) data was acquired from the questionnaires. The progression grid bands were acquired from the longitudinal data analyses and relate to each participant's overall (final) BDS score banding, as they progressed from beginning to end of their pathway, where b = bottom third, m = middle third and t = top third.

	Focus groups 1				
	BDS1 (C5)	BDS5			Total
		5-year programme (C2) Group 1	5-year programme (C2) Group 2	GPEP (C4)	
Identifier	1f1	5f1	5f3	5f2	
No. of participants	7	3	6	5	21
Male / female	4/3	2/1	4/2	2/3	12/9
Age range	18 - >25	All 23	22 - 24	26 - >30	18 - >30
Number taught by interviewer	0	3	2	5	10
Number that failed an end-of-year exam	1	0	4 (including BDS5)	2	7
DF1 ranking (range within group)	n/a	Top 50 to 800s	800s to 900s (n=3/6)	100s to 700s (n=4/5)	
PSS (range within group)		18 to 23	18 to 24 (n=5/6)	12 to 29 (n=4/5)	
Progression grid bands	n/a	ttttt to tttmt	ttttm to bbbbb	mttm to bbbb	
No. that also participated in interviews	1	1	0	2	4
Length of interview	54 mins	41 mins	65 mins	50 mins	3hrs 30 mins

5.2.2.2 One-to-one interviews 1 (2012/13 academic year)

A total of seven one-to-one interviews were conducted during 2012/13, comprising one BDS1 (C5) student and six BDS5 (C2, C4) students (Table 52). The age range was 23 to over-30, with three male students, four female students and four individuals that had been taught previously by the interviewer. The BDS5 students included three GPEPs and three focus group participants. The BDS1 student had also participated in the BDS1 focus group. An end-of-year BDS examination had been failed by three students. The total recording time was three hours 21 minutes.

Table 52. Gender, age range and other known factors, related to the students that participated in the one-to-one interviews during the 2012/13 academic year. The Perceived Stress Scale (PSS) data was acquired from the questionnaires. The progression grid bands were acquired from the longitudinal data analysis and relate to each participant's overall (final) BDS score banding, as they progressed from beginning to end of their pathway, where b = bottom third, m = middle third and t = top third.

	One-to-one interviews 1							
	BDS1	BDS5						Total
Identifier	1o1	5o1	5o2	5o3	5o4	5o5	5o6	7
Gender	F	F	M	M	M	F	F	3M/4F
Age	>25	24	23	>30	23	27	24	23->30
GPEP (C4)	n/a	Yes	No	Yes	No	Yes	No	3/7
Taught by interviewer	No	No	Yes	Yes	Yes	Yes	No	4/7
Failed BDS exam?	No	Yes	No	Yes	No	No	Yes	3/7
DF1 ranking	n/a	900s	Top 50	100s	Top 100	700s	>1000	<50 to >1000
PSS score	18	17	22	29	7	12	34	7 to 34
Progression grid bands	n/a	bbbb	tttmt	bbbb	tbttm	mttm	n/a	
Focus group participant	Yes	No	Yes	Yes	No	Yes	No	4/7
Length of interview (mins)	53	41	54	68	37	24	44	3hrs 21mins

5.2.2.3 Focus groups 2 (2013/14 academic year)

A total of seven focus groups were conducted during 2013/14. The BDS1 interviews comprised two groups containing five participants, one containing three participants and one with two. The BDS5 interviews comprised one group with two GPEP students and two groups of students on the 5-year pathway, each containing five students (Table 53). A total of 13 male and 14 female students were interviewed, with an age range of 18 to over-30. Four also participated in one-to-one interviews. The total recording time was seven hours 13 minutes.

5.2.2.4 One-to-one interviews 2 (2013/14 academic year)

A total of eight one-to-one interviews were conducted during 2013/14, comprising four BDS1 students and four BDS5 students, including one GPEP (Table 54). The age range was 19 to 28, with all eight being female and four individuals that had been taught previously by the interviewer. The BDS5 group included three students that had participated in focus groups and the BDS1 group included one such participant. An end-of-year BDS examination had been failed by one BDS1 student and two BDS5 students. One of the BDS5 students had deferred the first sitting of a BDS examination. The total recording time was six hours 24 minutes.

Table 53. Gender, age range and other known factors, related to the students that participated in the focus groups during the 2013/14 academic year. The Perceived Stress Scale (PSS) data was acquired from the questionnaires. The progression grid bands were acquired from the longitudinal data analysis and relate to each participant's overall (final) BDS score banding, as they progressed from beginning to end of their pathway, where b = bottom third, m = middle third and t = top third.

	Focus groups 2							
	BDS1				BDS5			Total
	Group 1 (C6)	Group 2 (C6)	Group 3 (C6)	Group 4 (C6)	5-year Group 1 (C7)	5-year Group 2 (C7)	GPEP (C8)	
Identifier	21f1	21f2	21f3	21f4	25f1	25f3	25f2	
Number of participants	3	5	5	2	5	5	2	27
Male / Female	2/1	1/4	4/1	1/1	0/5	3/2	2/0	13/14
Age range	19 - >25	18 - 23	18 - 20	23 - >25	22 - 24	23 - 26	28 - >30	18 - >30
No taught by interviewer	0	0	0	0	3	3	2	8
Failed end of year exam	0	0	1	0	0	2	1	3
DF1 ranking (range within group)	n/a	n/a	n/a	n/a	200s to 800s (n=4/5)	Top 50 to 900s (n=4/5)	100s (n=1/2)	Top 50 to 900s
PSS scores	7 to 31	14 to 25	11 to 19 (n=3/5)	10 to17	18 to 26	18 to 26 (n=3/5)	6 to 23	6 to 31
No that also participated in interviews	1	0	0	0	1	2	0	4
Length of interview	49 mins	62 mins	43 mins	67 mins	70 mins	74 mins	68 mins	7 hours 13 mins

Table 54. Gender, age range and other known factors, related to the students that participated in the one-to-one interviews during the 2013/14 academic year. The Perceived Stress Scale (PSS) data was acquired from the questionnaires. The progression grid bands were acquired from the longitudinal data analysis and relate to each participant's overall (final) BDS score banding, as they progressed from beginning to end of their pathway, where b = bottom third, m = middle third and t = top third.

	One-to-one interviews 2								
	BDS1 (C6)				BDS5 (C7, C8)				Total
Identifier	21o1	21o2	21o3	21o4	25o1	25o2	25o3	25o4	8
Gender	F	F	F	F	F	F	F	F	8F
Age	19	>25	19	19	28	23	23	26	19 - 28
GPEP (C8)	n/a	n/a	n/a	n/a	Yes	No	No	No	1 yes
Taught by interviewer	No	No	No	No	Yes	Yes	Yes	Yes	4 yes
Failed BDS exam?	No	No	No	Yes	Yes	Yes	No	No	3 yes
DF1 ranking	n/a	n/a	n/a	n/a	500s	900s	700s	900s	500s – 900s
PSS score	16	31	20	incomp	12	20	24	26	12-31
Focus group participant	No	Yes	No	No	No	Yes	Yes	Yes	4 yes
Length of interview (mins)	46	45	26	40	56	55	43	73	6 hours 24mins

5.2.3 Analysis

5.2.3.1 Overview

The coding process resulted in 117 initial codes, excluding the codes given to individual participants. The 12 codes related to the admissions and DF1 processes were excluded from further analysis, resulting in 105 codes, which were condensed into 17 parent codes. Most parent codes readily lent themselves to being placed into an emerging theme, though some were divided up and their constituent codes placed in different themes. “Assessment” was originally included within the “dental programme” theme, but due to the large size of this theme, “assessment” was made a theme in its own right. The resulting six themes were:

- Theme 1: The dental programme
- Theme 2: Assessment
- Theme 3: Study and supporting study
- Theme 4: Students: behaviour, differences and interactions
- Theme 5: Personal life
- Theme 6: Feelings

The six themes were all covered in each of the 26 interviews and focus groups conducted. The number of codes contained within each theme and the number of references made to each theme during the 26 interviews is shown in Table 55 and Figure 12.

Table 55. Themes and number of codes and references associated with each theme.

Theme	Codes within theme	References made to theme during interviews
Dental programme	22	1129
Assessment	6	365
Study and supporting study	28	1174
Students: behaviour, differences and interactions	23	501
Personal life	20	877
Feelings	12	521

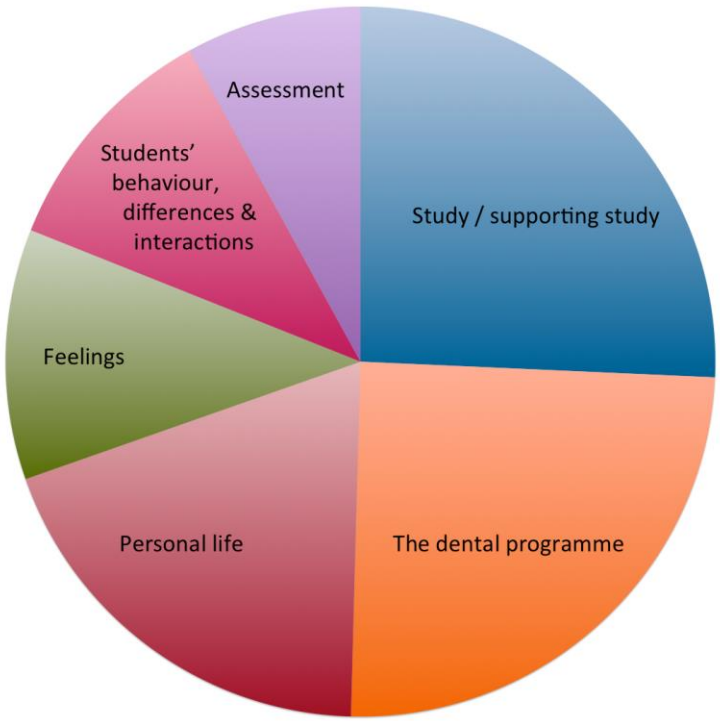

Figure 12. The six themes. The size of each segment of the pie chart represents the relative number of references made by students to each theme.

5.2.3.2 Theme 1: The dental programme

The 22 codes contained within the dental programme theme, included topics related to content delivery (such as tutorials and lectures), volume of work and administrative burdens.

A reoccurring element of this theme was the students' enthusiasm for small-group teaching sessions, such as tutorials, which the students felt aided progression. This was the case for BDS1 and BDS5 groups and both cohorts:

"I found the .... small group seminar tutorials a lot better [than 'big lectures'] *because you're in a smaller group, more comfortable asking questions* [5f1B: *"mmm"*] *and, and it's more focussed to what the group wants .... people can sort of direct it the way they want to, as opposed to a set curriculum"* (5f1A)

Students had mixed views with regards to lectures, with some finding them useful, though many disagreeing. Those that disliked lectures gave a range of reasons, including difficulties concentrating for long periods, the variable quality of lecturers and reluctance to ask questions in front of a large audience:

"....in the lectures there's so many of us, people are reluctant to participate when the lecturers ask questions, or to ask questions of the lecturer in front of everyone else, they'd only ask questions on their own after the lecture, so most people would miss out" (1f1B)

"....they might have a really good in-depth knowledge of their field of expertise, [the lecturer] *but the way they deliver it in lectures, can sometimes be really tiresome and dreadful and it's hard to follow"* (21f3E)

Some lectures were recorded, for students to view in their own time in a virtual learning environment ("lecture capture"). Students generally found this valuable, however an inconsistent approach to this process led to some frustration. One particularly interesting discussion took place in a BDS1 focus group (21f3), where students noted that some lectures, perceived as being poor when experienced "live", were considered very good when viewed on lecture capture:

"....sometimes we judge the lecturer before we've heard them on lecture capture [someone: *"exactly"*] *like X, he's actually a really good lecturer, but because he says everything specifically* [21f3E: *"very fast"*] *and very quickly, you think in the lecture "oh, I'm lost" but when you go back on lecture capture you realise he's actually telling you everything you need to know .... you just lose concentration on the day"* (21f3D)

The students did not appear to find the content of their work too difficult, however the workload was cited by both year groups as being "overwhelming":

"....I just feel we have such a massive volume of work now, and then there's so many different sources we have to go to, to get a good understanding, that it kind of becomes overwhelming, I just can't really cope with the workload sometimes." (21f3C)

"....I deal with it better now but yeah, I, I think it is really, really tough. It's the work-load instead of the material that we're learning" (5f3D)

The workload was perceived by several BDS5 students as being unevenly distributed across the programme, with BDS3 seen as being relatively light and the final year busy:

"Year 4 and 5 were much more intense. Year 2 was considerably harder than year 3 …. I didn't really feel like year 3 was an entity…." (25f2A)

Administrative burdens were cited repeatedly in this theme, though predominantly by BDS5 students who had clinical commitments:

"….parts of the school don't understand just how many things are coming together because we're getting e-mails from the KCH side, we're getting um Guy's reminders, some of the things are, are really, really, really, petty things that have really tight deadlines…." (5f2A)

The clinical quota requirements were discussed in several BDS5 interviews as having the potential to affect progression, particularly in the approach to final examinations. The lack of availability of suitable patients was cited as a common cause of trouble, though a number of students felt good organizational skills and a proactive approach helped avoid this problem:

"….I can personally say I have attended everything, I've rarely had a day off in like, 5 years and I still have catch-up sessions to do, and that's based on patients just not being allocated to me [5f3C: *"yeah, exactly"*] *or turning up…."* (5f3D)

The BDS5 students who attended the outreach clinic in Portsmouth viewed the experience as having a positive effect on progression, due to its relatively small size and approach to student support:

"….the people down there, because there's a smaller group of us, they care about us so much …. you know it is utterly fabulous down there, and it can't be expressed enough…." (25f3C)

5.2.3.3 Theme 2: Assessment

The six codes within the assessment theme included discussions surrounding the failing and resitting of examinations and the honours system. The BDS1 (C6) students, interviewed during 2014, were the first cohort undertaking a new curriculum. These individuals were enthusiastic about the introduction of multiple formative assessments, however there was a general perception that the content of the examinations did not match the content of the taught material, leading to frustration and de-motivation. Students explained that they were often tested on minutiae, rather than having to demonstrate a general understanding of a topic, leading to uncertainty about the depth of study required. The BDS5 students occasionally voiced similar concerns, though they were less vociferous, possibly reflecting the more clinical nature of the assessments:

"Yeah, I think it was good we had those assessments along the way, but I think we should have been tested more on our overall understanding of the topic in the final exam...." (21f3C)

"....I did actually pass that exam but I came out, and I thought 'why've I just wasted all these hours sitting at my desk? .... and then be asked on a whole host of other stuff that we haven't been taught', for me was very, very de-motivating." (21f1B)

"....you've had cases when the exams themselves have been a bit not we expected them to be [people speaking over: *"yeah not representative" "every year"....*] *and what we'd be prepared for...."* (5f3F)

Discussions with students that had failed examinations established a range of contributory factors, including health issues and family problems. There was a perception, by some, of inadequate support during the resit process, which is discussed further in Theme 3:

"....I think it was just the general struggle of university and um you know getting used to it all and being away from home and living out and being around people that I'm not used to being around, I found it quite tough and also just getting a bit carried away with the social life...." (5o6)

"....all that information accumulated .... self-directed learning days was taking [relative] *to hospital .... and then we were in lectures or on clinics every single day, so I didn't have that time to actually sit down and make sense of all the information I had...."* (25o1)

A number of BDS5 students raised the honours system during discussion, which appeared to motivate some individuals to work harder, though was a two-edged sword resulting in considerable pressure for some:

"....from third year onwards I was crying before every single written exam .... I felt like I had to push my boundaries, so probably that did help my progression in the sense that I was more motivated and I wanted to do the best I could .... but then the stress probably hindered me because mentally I can't really cope with it...." (25o3)

5.2.3.4 Theme 3: Study and supporting study

Theme three contained the greatest number of references and codes. The 28 codes included discussions concerning student study, teachers and teaching groups. The theme also covered various types of support, including university counselling services, personal tutors and peer support. The

transition process from school to KCLDI and associated study issues was included.

Uncertainty concerning the breadth and depth of study required was a recurring topic, as highlighted in Theme 2. BDS1 students in both academic years discussed the transition from school to university, including changes in work volume, teaching style and size of teaching groups. This was generally perceived as a change for the worse, with regards to progression, resulting in reluctance to ask questions in front of large groups of people and an inability to benchmark knowledge against past examination questions:

"....when you're at school, you've got 25 in a class and your teachers know you by name, and they know how you're progressing every day, but being at uni they probably don't know your name and they can't see how you're progressing .... and you don't necessarily know how you're doing with your work" (21o4)

The importance of feedback was discussed by both BDS1 and BDS5, especially receiving feedback following examinations. There were some examples of good feedback, though most discussions centred on inadequacies in this area:

"....they don't give you feedback on exams .... how would you improve on things that you've got wrong if you haven't been told, you know, what exactly you did bad .... [21f2C: *"questions you got, yeah, yeah, I would definitely agree with that I think"*]*...."* (21f2D)

The "support" sub-theme contained some particularly interesting discussions with students, particularly those in BDS5. Small study groups, and similar

peer support, was frequently mentioned, by all student groups, as being very beneficial to progression. Interviewees that had experienced progression difficulties due to significant personal events, such as severe financial hardship, medical problems or family crises, were very positive with regards to the support they received from the university:

"....the school was fantastic, a lot of the time when I was in real, deep trouble, either with paying fees or, in fact in final year my accommodation was paid for by special funds...." (25f2B)

"....there was a couple of times I thought about just um, stopping, um, but, um, I was helped by King's um to, to, to keep on going .... having a, some counselling, um, I was very sad .... but, erm, King's were good, they helped...." (5o3)

Several individuals however mentioned a reluctance to come forward and discuss problems, either due to personality or cultural reasons or a perception that disclosure of certain problems could result in losing their place on the programme, or being barred from practising as a dentist:

"....I was scared, because I thought the occupational health review, if they said anything about me not being able, like fit to practise essentially, that they'd kick me off the course, and I was terrified and so I think I was trying to put on a bit more of a brave face...." (25o4)

"....mental health illness, it's seen as hugely negative .... I didn't want to be having counselling, do you know what I mean? .... so I said 'no'...." (25o4)

"....the way that I've been brought up is that you deal with your own personal problems...." (25o1)

A lack of awareness of the support services available was cited as a problem by some students, or difficulties accessing them due to other commitments. Similarly some felt the personal tutor system was deficient. These issues were raised by both year groups:

"....I didn't realise the avenues of help that I could get from the College, so I just tried to deal with it all on my own and I couldn't and when I failed my first sitting, I pretty much broke down, and I wasn't sure what to do, I was really stressed...." (25o1)

"....there is this workshop .... that will help with your stress levels, so I went along .... it did help you a great deal, but then it was the awareness of it, like no one from the Dental Institute said to me this was available for you...." (1f1E)

"....I really think that the majority of kind of pastoral care has come from each other .... the lack of general pastoral care .... has really like at times affected me, I think. We have a personal tutor, but meetings with them are infrequent aren't they?" (25f3A)

Interviewees were generally negative about the academic support offered to students that had failed examinations:

"....I failed in first year, there was no support from anywhere, it's kind of just like, alright you have a meeting [5f3B: *"you've got 6 weeks to revise again, that's it"*] *with Dr* [tutor's name] *yeah, then you just revise again, they won't give you your exam paper to see where you went wrong, they won't help you out if you needed the help...."* (5f3C)

Many teachers were highlighted by interviewees as being very supportive and a great help to progression, whilst others were seen as being the opposite:

"….she has this gift of being able to exactly explain to you where you've gone wrong …. she'll explain exactly why and it all makes perfect sense …. that was hugely helpful, she gave really constructive criticism but she never ever let you feel like it was your fault and you were a failure…." (25f3B)

"….I find that the clinical teachers and all the staff just make it so enjoyable and everybody's really passionate …. really caring and they really do love teaching, and that's had a really positive effect on me, here, because a lot of them are so encouraging…." (25o1)

"….I'd go to my demonstrator, he'd always belittle me, probably because he felt he could because I'm a guy basically …. we were practising on loose teeth, so I did a restoration …. I wouldn't even show him in the end, I'd just do it and probably show the person sitting next to me …. because I'd be scared about going up to the teacher and knowing he could make a joke and almost make an example out of me in front of the class…." (25f3E)

"….I just felt sort of targeted …. that just made me feel really unhappy in certain departments and I didn't want to come in and like dentistry for me was changing to a point where …. I wasn't sure if it was what I wanted to do anymore, because of these people…." (25o2)

Student resources were discussed, with the library generally viewed favourably. The virtual learning environment received mixed comments from

both year groups, as outlined in theme one and the wish to have a printed copy of lecture notes was a repetitive topic:

"....the dental department make the assumption that we're of a generation that can learn off computer screens, so we don't need to print things .... I can't learn that way at all .... and I end up spending so much money on printing for that reason." (21o2)

Problems with communication, from KCLDI, were discussed by both year groups. The BDS1 students' main concerns involved a perceived lack of information with regards to course and examination structure and of receiving conflicting information from staff, particularly in the case of the 2013/14 academic year. The BDS5 students' concerns were more focussed on the volume, nature and timing of communications, which at times necessitated prompt responses and actions, during a crucial revision period in the lead up to finals:

"....sometimes different lecturers and so on tell you to revise different things .... and when it came to actual test day, Dr [X]*, the head of our course said 'No, I don't want you to learn that, it's fine, you don't need to have that much detail'...."* (21f1A)

"....particularly with the sign-up to, to finals where you'd completed things .... and you got an e-mail saying 'oh you've not been signed up, you can't take your exams' .... that was stressful a week before exams when you, [laughs] *you need to have your head in your books...."* (5o1)

5.2.3.5 Theme 4: Students: behaviour, differences and interactions

Theme four contained 23 codes, and covered discussions about peers, differences between groups of students, such as GPEPs versus non-GPEPs,

and communication between students. A sub-theme apparent in BDS5, though less so in BDS1, was the effect tutorial group composition had on progression:

"....something that did affect I thought, my progression, was it depended on who was in your group, so I felt there was favouritism from tutors .... I wasn't able to do stuff that others were able to do" (25o3)

"....we had the 'rude boy group' .... and like although you wanted to learn, um it was really, really hard to like learn in that sort of group...." (5f1C)

The BDS5 students frequently discussed the value of good clinical partners and the detrimental effect weak partners had on progression:

"....it does make a huge difference, if you have got a partner that's really sort of .... keen and eager .... you're going to learn more from them and you're, you're going to be happier working together...." (5o4)

Analysis of all interviews observed only two direct references to gender, in relation to progression. One involved a male participant, who felt males possibly find difficulties seeking help if struggling, and the other a female participant whose male friends appeared less affected by conflicts with staff, compared to her female friends:

"....it's something that can be quite difficult, quite difficult, especially I think without sounding too sexist, for males, I think it's a sort of an ego thing, I think .... one thing that he, he struggled with was, going up to someone and saying you know 'I need help'...." (5o2)

"....I live with .... boys, and they don't ever seem to get affected in this way .... some nurses really treat me like I'm nothing .... I have had friends who've been really upset by them, but girls" (25o2)

The BDS5 students on both the 5-year and GPEP pathways viewed the GPEPs as being generally more mature, relaxed and less stressed than the 5-year students. The GPEPs were considered to be more motivated, having got the "university experience" out of their system, and to have better communication skills with patients.

"....I remember that some of the comments the GPEPs made that we were stressing out too much, maybe because they've been through it, they know that it's going to be ok, and you've no need to like stress that much...." (5f1B)

One GPEP believed they were more focussed as a group, due to the need to juggle many other responsibilities:

"....'cos they have other commitments, some of them are married, they have children .... their time's a lot more precious .... it's a lot more productive .... you don't go to the library for 4 hours and spend 2 hours of it dossing about, you spend 4 hours focussed...." (25o1)

A notable BDS1 and BDS5 sub-theme was the use of social media and instant messaging tools, such as WhatsApp, to assist progression, by facilitating communication and peer support.

"I think the WhatsApp system from third year for most people makes a big, big difference [someone: *"Yeah...."*] *because it just gels people together, which makes you feel more supported"* (25f3D)

"We have a facebook group, for everybody that's in BDS1 .... basically if someone finds a resource that they found really helpful .... people post things on there and it's just fantastic, because you get to see resources that you might not have found necessarily, and everybody's so open to help each other." (21o4)

Students had a tendency to compare their experience, at KCLDI, with that of students at other dental schools or with individuals studying different subjects. Both positive and negative comparisons were made:

"....we see patients quite early, earlier on compared to other dental schools. I think that motivates you to work harder because .... if you're seeing the patient you're gonna read up on it, you're gonna try and understand what you're doing so that you, you, you're like confident in front of the patient...." (5f1C)

5.2.3.6 Theme 5: Personal life

The 20 codes contained within the personal life theme covered areas including students' social life, medical problems, accommodation and finance. Social life was a large sub-theme, which provided triangulation with the questionnaire results, and was discussed by both year groups. Students recognised the importance of striking a balance between social life and study, and the potentially adverse effect on progression if they failed to achieve this balance:

"....I kind of had to make a choice, either I was going to be fully involved in the netball club and be like a part of the team, go to Guy's bar every Wednesday .... but I didn't do it because I knew I had clinics on Thursday .... everyone knows on Guy's campus, that dental students aren't fun, they don't get involved...." (25f1D)

"I think social life .... sports teams .... going to do training regularly, going to the sport's socials, going to the sport's matches, which not only is in London, but can be nationally, all over the country .... I'm doing a dance show right now .... I'm rehearsing every day so all these days I'm rehearsing and spending time with my dance teams, I am not working...." (21f1C)

Technology was specified by some participants as being intimately related to individuals' social lives and ultimately their progression:

"I think the biggest social problem is our phones and Facebook and things like that. At the end of the day it's much healthier talking to someone .... one-on-one rather than wasting time on a computer...." (25f3C)

"....things like video games, playing PlayStation [someone laughs] *keeps you up at night and then you're tired the next day, you can't take in anything* [someone: *"yeah"*]*"* (5f3B)

Financial issues were discussed in all 26 interviews. Despite accumulating large debts, most were not concerned and did not believe that it was affecting their progression. This was of particular interest with the BDS1 students, interviewed in 2014, as they were the first cohort to pay the £9000 annual tuition fee. A BDS5 student commented:

"I've got huge loans .... I'm hoping that I'm going to have a job for quite a few years and I'll pay it off slowly .... so it's not something I think about to be honest. If I didn't have that job lined up, trust me I'd be worried, [25f3E: *"that's true"*]*...."* (25f3D)

Students with prior degrees appeared more concerned about their finances however, as many had very high levels of debt, less financial support from

government and significant financial commitments, such as mortgages. The progression of some of these individuals was hindered by the need to undertake paid employment, resulting in tiredness, or impacting on study time:

"….I sort of aim for a distinction, I have to be realistic …. I'm probably not putting in enough work because I, I just can't, um, and there's, sometimes when you come home from work on a Saturday evening and you open a book and there's almost no point in opening it sometimes because you're so exhausted…." (1o1)

Discussions related to accommodation resulted in mixed opinions, with both negative and positive effects on progression given. Students living in the parental home explained they had fewer domestic chores and responsibilities, compared to those living elsewhere, thus freeing up study time. Those living away from home, by way of contrast, commented on transition difficulties associated with fending for themselves. Some individuals, living with parents, reported difficulties with study as a result of isolation from peers, social distractions or noise. There appeared a cultural aspect to this sub-theme, with some Asian students commenting on family pressure to participate in social events, which often took up a significant amount of time:

"….feeling socially isolated did significantly slow me down studying-wise, I ended up sort of just coming into the library and working to about 11pm at night all through third year because, if you're at home alone there's no one to motivate you…." (25f3B)

"….we had a really big …. typical Asian wedding and that took a whole month and because I was living at home it was expected of me to go along to every single function, and every

single shopping trip, and …. we were going to sleep at 3 o' clock and we had 9 o' clock starts, so for the whole month I did no work …. which was hard to catch up with as well…." (21f2A)

A recurring point, made by those living in university halls of residence, was that most residents studied non-dental courses and had very different timetables and volumes of work. This discrepancy led to progression difficulties, due to noise and similar distractions, particularly during examination periods. The social life in halls was appreciated however and the opportunity to develop social networks and to study with other resident dental students:

"….I think it helps having other people studying around you, um, and you kind of see they're studying and you think, 'ok I need to get on with it'…." (5o1)

"….only about 3 dentists were in the halls …. I had best friends, who were doing other courses …. they would come back drunk …. at 5 o'clock, knocking at my door saying '…. wake up ….', and then I'd get angry 'I've got an exam in 5 hours …. leave me alone' …. I'm lucky now because I live in a flat …. and I think my grades have reflected that, they've definitely shot up…." (25f3E)

The journey time from accommodation to university was mentioned frequently as a hindrance to progression, as it reduced available study time and often caused tiredness:

"….doing 2 hours a day [commute] *I get home and I've got to cook, I'm absolutely shattered, I can't do any more work after that …. and that probably affected my overall grade at the end of the year…."* (25o1)

5.2.3.7 Theme 6: Feelings

Theme six contained 12 codes, and covered personal feelings such as stress, morale and motivation. The general atmosphere of the dental school was also included in this theme and the impact it had on students' feelings and well-being. A recurring topic, with both BDS1 and BDS5 students, was the perception of a negative atmosphere at university, leading to problems with morale and motivation. There appeared a difference between campuses in this regard, with the Guy's site viewed unfavourably compared to the other three campuses:

"….there is a kind of negative kind of expectancy that students are not going to work …. and then what happens is when somebody is really struggling they don't come and ask for help…." (21f4B)

"If you're not happy you're not going to perform well, as in, I know students who …. won't even book in patients for Guy's, they're just going to book in patients for King's because why would you want to be somewhere where you're not happy?" (25f3E)

"….so if there is some kind of positive feedback, something to make you want to come in, we'd feel valued then, we feel like we are constantly told off, so I think that would help in progression more" (25f1B)

It became apparent that the majority of interviewees had experienced high levels of stress at various points during their programme, with examinations being a significant stressor for both year groups and clinical quota requirements for BDS5:

"….not only are you trying to be great at all the academic side, you've got to be great at all the clinical side of it …. that is the most stressful thing, you know, because potentially whatever you do could be damaging to your patients and that level of stress I think does affect progression …. you kind of shy away from doing the more complex stuff …. and obviously that does affect progression because it affects your quotas…." (25o1)

"….the course can be really stressful, especially if you're not organised, I think, um, a lot of people get pressured unduly because, um, they think they need to sort of, you know, make quotas and things…." (5o4)

Some students were evidently more affected by their stress levels than others, with significant effects on progression being discussed in some instances:

"….does high stress affect progression for me? That was absolutely the case …. which prevented me from kind of passing my exams…." (1f1E)

One student gave a contrary view, though this opinion did not emerge as a theme:

"….I actually found stress was helpful. When I wasn't stressed I wouldn't get much work done, I, just felt like I didn't need to, but as soon as I got stressed I could, I got ….. I went to the library and I stayed there for days and got everything done…." (1f1B)

5.3 Discussion

5.3.1 Outline of main findings

The 26 focus groups and interviews comprised 55 different students and involved 20 hours 28 minutes of audio recording. Thematic analysis resulted in the identification of six themes: the dental programme, assessment, study and supporting study, students' behaviour, differences and interactions, personal life and feelings. The range of conversational topics were largely the same for both BDS1 students and BDS5 students, though BDS1 also discussed the transition from school to university and BDS5 discussed clinical issues and outreach teaching. Similarly the topics of discussion were very similar between the two cohorts of students interviewed (2013 and 2014). The nature of students' interactions, with the people surrounding them, emerged as a crucial overarching factor influencing progression. In particular the importance of support offered by peers, teachers and parents, whether academic or pastoral.

5.3.2 Recruitment

The recruitment of volunteers proved to be difficult, especially with BDS1. The BDS1 students were undertaking and new to an intense programme, which possibly explained their reluctance to participate in the research. The low level of recruitment in cohort one (2012/13) was one of the reasons a second cohort (2013/14) was used. During the questionnaire distribution for cohort two, the principal researcher explained the nature of the focus groups and interviews in depth, which possibly contributed to the improved participation rate seen with this cohort.

5.3.3 Sample

The intention had been to undertake purposive sampling (Denscombe, 2010), with equal numbers of high and low achieving students being selected. The limited number of volunteers made this method unviable and so all volunteers were interviewed. The resulting sample appeared reasonably representative of BDS1 and BDS5 students at KCLDI. It contained a mix of males and females of different ages, some of whom had progressed well, and some whose progression had been hindered for various reasons. Participating students included some that had failed end-of-year examinations as well as some that had obtained distinctions in examinations,

5.3.4 Bias

The interviewer's age, gender and race will all potentially influence the interview process (Denscombe, 2010 and Cohen et al., 2007). The interviewer was a white male and had previously taught some of the participants, who were a mix of genders, ages and ethnic backgrounds; it was not possible to ascertain whether these factors impacted the process, however bias can occur at various points (Bell, 2005), and the analysis can never be bias free (Guest et al., 2012). Coding checks by a second researcher and use of triangulation helped to provide validity and reliability to the analysis, as suggested by (Guest et al., 2012).

5.3.5 Size and dynamics of focus groups

Due to difficulties identifying mutually convenient times, four of the 11 groups contained only two or three participants (Table 51 and Table 53). The dynamic of these four groups worked however, with the participants interacting well and generating rich data.

One BDS1 focus group member (in group 1f1) did not utter a single word. The remaining participants in the group communicated freely, in a friendly, good-natured discussion, suggesting the lack of participation was not due to intimidation, but reticence in speaking out. Some individuals are naturally quiet or feel uncomfortable with the groups' composition (Finch et al., 2014) thus illustrating the value of also conducting one-to-one interviews to ensure 'silent voices' are heard (Michell, 1999).

5.3.6 Conducting the focus groups and interviews

The rationale for undertaking the one-to-one interviews after the focus groups, was to enable the emerging themes to be explored in greater depth. The interviewer was relatively inexperienced at undertaking focus groups and one-to-one interviews, which resulted in some conversations veering off-topic at times and the generation of large volumes of data. Similarly, a more experienced moderator may have probed some points further, for example one student mentioned it was "easy to play the system" with no explanation of what they meant. Ideally participants would have been re-interviewed, following initial transcription and coding, allowing further exploration of such

areas. The logistical difficulties of doing so within a narrow timeframe made this approach un-realistic.

The use of video recording, or a second person making notes during the process, may have helped, as attempting to write field notes whilst moderating the discussion proved difficult. Doing so would, however, have been intrusive and participants may have felt intimidated (Cohen et al., 2007). The resulting interviews did generate much relevant and rich data.

5.3.7 Transcription

The process of transcription proved to be very time consuming, significantly exceeding the estimate of Edmunds & Brown (2012) of five times the length of the audio-recording (for experienced typists). It was decided, for this reason, to exclude the paralinguistic cues, such as ums and errs, when transcribing the second cohort of interviews, as they did not enhance the subsequent analysis. Consideration was given to employing professional assistance or use of voice-recognition software. Transcription by the principal researcher, however, allowed a deep understanding of the data and informed the analysis (Braun & Clarke, 2006).

5.3.8 Thematic analysis

The analysis revealed the very complex interaction of multiple factors involved with student progression. Individuals have very different personal contexts, comprised of a range of factors, including their prior educational background, living arrangements, health and family support. The participants

tended to focus on factors perceived to hinder progression and needed encouragement to discuss factors that helped progression.

A decision was made to group together the GPEP and 5-year pathway BDS5 students for analysis, due to insufficient numbers of GPEP volunteers to achieve saturation as a distinct group. Interviewing the two groups separately did however enable an exploration of differences between the two, with less risk of bias, and enabled specific quotes to be attributed to GPEPs where appropriate. Similarly the BDS1 students were interviewed separately from the BDS5 students.

The search for themes involved analysis of all the interviews from both BDS1 and BDS5 simultaneously, as opposed to analysing the two year-groups separately and producing separate themes for each. The rationale for this was that the BDS5 students often discussed experiences they had had in previous academic years, including BDS1. In addition, many topics of conversation were very similar for both year-groups and thus the six emergent themes equally relevant to both. Once the main themes had been established, the NVivo software enabled the BDS1 data to be compared to BDS5 data, allowing comparisons to be made.

The two cohorts (2013 and 2014) were also analysed together, as their experiences were similar, though the second BDS1 cohort did differ somewhat, as it was undertaking a new curriculum and was the first year to pay the £9000 annual tuition fee.

During the analysis it became apparent that data saturation had been achieved, with no new codes being generated.

5.3.8.1 Theme 1: The dental programme.

Tutorials were perceived to help progression, which provided triangulation for the questionnaire results, however students explained quality varied, depending upon the teacher and the nature of the participating students. Expansion of tutorial provision would be desirable, however the practicalities of doing so may be challenging due to manpower and space restraints. Lectures by contrast were viewed less enthusiastically, with several participants commenting on difficulties concentrating for long periods of time, or of poor quality lectures. The reasons given for liking “lecture capture” were similar to those observed by Williams et al. (2016), whose students cited confusion with content and inability to keep up with “live lectures”. The expert knowledge of the lecturers was not questioned, but their ability to communicate their expertise was. A suggestion for improvement would involve the development of lecturers’ presentation skills, as well as the expansion of the lecture capture facility, to enable students to play back a recorded lecture in their free time.

The volume of work was viewed as a hindrance to progression, due partly to the problem of finding time to undertake it. This provided triangulation with the questionnaire results, which established that BDS1 students found the difference in volume of work, between school and university, difficult. The perception that workload was spread unevenly across the programme,

resulting in increased pressures and stress in the final year, is an issue that needs to be addressed with the current revision of the curriculum.

The BDS5 students expressed the view that their progression was affected by administrative burdens, related particularly to their clinical activity. Students explained valuable time was taken up by completion of paperwork, for example requesting patients, or responding to e-mails concerning completion of patient quotas. It could be argued that students are being trained to be team-leaders and learning to deal with the administrative aspects is important. It would be desirable however, to reduce some of the administration burden in the lead up to final examinations. The use of recently introduced electronic resources at KCLDI, such as LiftUpp (Longitudinal Integrative Foundation Training Undergraduate to Postgraduate Pathway), may help address this. LiftUpp is an app (application), accessed by staff on an iPad and designed to record the clinical performance of students (LiftUpp, 2012).

Some students found the task of completing clinical quotas easier than others, dependent upon how proactive individuals were and the availability of appropriate patients. Lower levels of conscientiousness are associated with a dis-organised approach (Ferguson et al., 2014) and it is possible that some of the individuals struggling to achieve quotas were less conscientious. Students' personalities were not assessed during this research, however it would be interesting to explore potential links, between personality and meeting clinical targets, in future work. KCLDI has recently increased the

volume of patients attending the clinics, though quota deadlines could possibly be brought forward, to reduce pressure on students immediately prior to their examinations. Interestingly, and somewhat contradicting the above concerns, students often compared their experiences to those of friends elsewhere, in a favourable manner:

"....I didn't expect I'd get this much clinical experience, it's been absolutely fantastic for that, I mean I speak to other students in other universities and how much they do, compared to us, is hardly any, in terms of patient, in terms of things like extractions or sedation .... so the clinical side of things went beyond my expectations...." (25o1)

The achievement of quotas does not necessarily equate with competence however, with some dental schools having no specific quota requirements, but utilising competency assessments instead (Youngson et al., 2007). Indeed, Dawson et al. (2016) argue that breadth of experience is at least as important as amount of experience, with the collection of large quantities of learner specific data required, across several domains, to help determine competence.

The outreach clinic at Portsmouth, attended by half the BDS5 students on a one-week-in-four rotation, was viewed very positively. This mirrored the enthusiasm for outreach teaching held by Cardiff University dental students (Lynch et al., 2010a) and the sense of belonging reported by students at an outreach centre (Radford & Hellyer, 2015). Interestingly, it was not so much the nature of the clinical work that was perceived to influence progression, but the environment, which appeared to increase motivation and morale.

This was due in part to the relatively small size of the outreach centre, with the Guy's campus being much larger:

"Especially when you've been to Portsmouth, you realise that this place is a factory." (5f3B)

The small size may help staff forge closer relationships with students, as highlighted by the student's comment quoted in the results (Section 5.2.3.2) and so engender a sense of belonging (Freeman et al., 2007). This in turn may assist disengaged students, as suggested by Morosanu et al. (2010). The recent introduction of a new "team structure" at Guy's campus, which involves students undertaking their clinical activity within smaller units, may help to overcome this issue of size.

5.3.8.2 Theme 2: Assessment.

The students' perception that examination topics did not fully reflect topics taught during the programme has the potential to impact significantly on student progression. Progression may be affected directly by the failure of examinations due to lack of knowledge, or ability, or indirectly as a result of de-motivation of students. A discussion, quoted in the results (Section 5.2.3.3) illustrated that despite passing an examination, some students felt de-motivated, as they perceived that they had wasted much time preparing for an examination. This was in agreement with the observation of Kinchin et al (2008b) that assessment may not test subject understanding and so should be developed in conjunction with pedagogy. Similarly, Schuwirth & van der Vleuten (2004) recommended use of a range of examination

methods, customised to the specific requirements of the assessment. It is thus apparent that not only should all the taught content be of relevance but that students appreciate the relevance. This is illustrated by the following quote from a BDS5 GPEP student:

"….taking it back to progression of students through the dental course, if there isn't relevance to it I don't see the point in learning it …. I think showing relevance is vital." (25f2A)

BDS1 students explained that there was an expectation for them to appreciate the "wider picture" and understand the broad nature of a topic, rather than the rote learning of very specific facts and figures. The nature of the assessments however did not necessarily fully reflect this expectation, for example the online examination, with its multiple-choice style format, tending to necessitate the testing of very specific detailed facts and rote learning, rather than broad understanding of a topic.

The interviews included some participants, in both BDS1 and BDS5, who had failed end-of-year examinations. The causes of failure were varied, providing triangulation for the questionnaire analysis. The interviews determined that many felt a lack of adequate academic support and feedback during the resitting process; this is an area that will need to be reviewed in light of this finding. This has similarities with the observation made by Yorke (2000), that struggling students lacked support (though she did not expand on the nature of support).

The discussions related to the honours system were of interest. The top performing students in the end of year examinations are awarded a merit or distinction, with the exact criteria varying from year to year. Students that performed well throughout their programme were awarded honours. The system appears to have both a positive and negative impact on progression. There is a motivating element, with individuals putting in extra effort in order to try and achieve honours, however some may be putting themselves under undue pressure as a result, with the potential to cause a negative effect.

5.3.8.3 Theme 3: Study and supporting study.

The challenges to effective study, experienced during the transition from school to university, were un-surprising and concurred with the observations of Krause (2001) who explained the importance of supporting students through this period. Clear, unambiguous, non-conflicting communication from course organisers concerning requirements may help this.

Examination feedback was perceived inadequate in some instances, though there was evidence of good feedback practice in specific disciplines. This may be related to the nature of the assessments, where a more generic feedback is deliberately given in certain cases, such as multiple-choice style examinations, where re-use of questions is a possibility. This is in agreement with the observation of Poulos & Mahony (2008) that students in their qualitative study preferred specific as opposed to general feedback. Agius & Wilkinson (2014) concluded that further “robust evidence” is required about students’ expectations of feedback.

Students' use of peer support and the value they placed upon it, were observations similar with those of Burk & Bender (2005), whose survey of first-year dental students found informal peer support to be more effective than other internal support measures. Todres et al. (2012) similarly noted re-sitting students appeared to have difficulties engaging with their peers and Woolf et al. (2012) observed medical students, who had close friendships with high-performing peers, demonstrated improved performance.

The mixed opinions with regards to teachers was unsurprising, as inevitably not all staff will be viewed entirely positively by all students, however what was a concern were the comments by some students relating to undesirable staff traits such as being intimidating or unapproachable. Sweet et al. (2008) similarly received both positive and negative views from students concerning staff and a reluctance of some students to approach teachers was an observation made by other researchers (McMillan, 2013 and Krause, 2001). Peer review of teaching is undertaken by some staff, however further engagement with this scheme using a non-evaluative approach, as suggested by Cunningham & Lynch (2016) would be beneficial.

Students suffering significant personal problems were positive about the pastoral support received from KCL. A notable finding however, was that some of these individuals were initially unaware of the help available, or were reluctant to come forwards, thus delaying the onset of assistance until their progression had been significantly affected.

"....last year I had kind of personal family problems, so I wasn't really in the frame of mind to be able to go [1f1C: *"it wasn't your priority"*] *ask for help anyway...."* (1f1E)

Mills & Blankstein (2000) observed socially-orientated perfectionists were less likely to seek help, and it is possible students expressing this view had this personality trait. A concern voiced by one participant, was the fear that disclosure of medical problems would prevent him/her from being entered onto the General Dental Council's register upon graduation, thus barring him/her from the practice of dentistry. This raised the possibility that other students were in a similar position, and avoided seeking essential help, through fear of future professional sanctions. A similar observation was made by Chew‐Graham et al. (2003) during their semi-structured interviews with medical students. KCLDI students are informed about the support services available, however this information perhaps needs to be continually repeated, in addition to the message that individuals' personal wellbeing must take precedence over other considerations. Personal tutors should perhaps be more proactive in asking individual students about their wellbeing, rather than waiting for students to present themselves.

An emergent sub-theme was the perceived lack of support for less significant problems. Several interviewees discussed the personal tutor system and expressed the view that it was of little help, due to the large number of students each tutor was managing and apparent lack of engagement of some of the tutors. Interviews conducted by Wilcox et al. (2005), with students who had withdrawn from university, established some had similarly

experienced problems with their personal tutors, including approachability and availability. It became apparent that a robust pastoral support system is essential, to help identify problems at an early stage, before they impact on progression. A suggestion for improvement of the pastoral support system would involve tailoring it to support the individuals better. Consideration of prior experience and the need for personalised support was an issue discussed by Crafter & Maunder (2012), who explained that a "one size fits all" approach may be inappropriate. Interestingly, it was also a recommendation made by one of the GPEP interviewees, when discussing his peers:

"....I think mentorship may need to be individualised a little bit more for the GPEP group ..... I think there is a maturity that these folk need to be treated with...." (25f2B)

5.3.8.4 Theme 4: Students: behaviour, differences and interactions.

The discussions related to tutorial group composition have relevance to progression, though are not easily resolved as there will always be personality clashes. Hausmann et al. (2007) reported peer-group interaction and peer support were associated with a sense of belonging, which in turn has been associated with academic performance (Glass & Westmont, 2014). Additional teacher training and support may however allow such issues to be identified and addressed to an extent. Similarly the clinical pairings of students need to be monitored carefully to ensure individuals are not disadvantaged.

The observation that there were only two direct references to gender, provided triangulation with the questionnaire results, which found few statistical differences between genders. The comment concerning males, not seeking support, reinforces the earlier observation that pastoral care should perhaps be tailored, with for example, male students explicitly asked about their need for support.

The perceived differences between GPEP and 5-year students, demonstrated the importance of interviewing the groups separately, allowing individuals to freely express their views. As a group, GPEPs potentially had a greater number of factors impacting upon their progression, such as family commitments, as established by Newton et al. (2011) during their interviews with GPEPs. Arguably however, they had better coping strategies, due in-part to greater maturity. In their work with Australian students, Kearns & Gardiner (2007) found the most important time-management behaviour was having a clear sense of career purpose, which resulted in higher perceived work-related effectiveness and less work-related distress. It could be argued that GPEPs may have a greater sense of career purpose than some individuals straight from school, resulting in better time-management. The observation from students on the 5-year programme that GPEPs appeared more relaxed and less stressed, supports this to an extent, as did comments made by some GPEP students, outlined in Theme 1, that having good organizational skills and a proactive approach helped meet quota requirements in BDS5.

Discussions about the prevalence of social media use was expected and in agreement with the observations of Quan-Haase (2007). Karpinski et al. (2013) discussed a relationship between increased use of social media and decreased academic performance, however most accounts given by KCLDI students were positive and emphasised how social media enabled effective work-related communication between students.

5.3.8.5 Theme 5: Personal life.

It is highly probable that despite interviews providing an insight into students' personal life and problems faced, in relation to progression, much remained unsaid due to a reluctance to disclose such issues in front of peers or member of staff. Despite this, it became evident during the interviews that a number of interviewees had considerable on-going challenges to contend with in their personal life, including, for example, being the carer for a seriously ill relative. This illustrates the importance of ensuring students are fully aware of the avenues of support available to them at KCL and the confidential nature of these services.

The questionnaires established that social distractions were perceived to be a hindrance to study and interviews established these distractions took many forms. Students appeared aware of the need to achieve a fine balance between work and play, with some being more successful than others. The difficulties experienced by dental students appeared in part to result from the unique time-intensive nature of their programme and the extent to which it differs from those of non-dental student friends. There is no obvious solution

to this mis-match other than possibly giving advice as to available coping strategies, including time management skills. Kennedy & Tuckman (2013) suggested such time-management training, during students' first term at university, may also help reduce procrastination and stress and increase students' sense of belongingness.

The questionnaires completed prior to the interviews, established that most students were not worried about their high levels of debt. The interviews established that many expected to enter a highly paid profession upon graduation and be in a position to repay the debt. The BDS1 students (2013/14 academic year) were the first group to pay increased tuition fees, of £9000, and it is conceivable that this group's opinions may alter with time. Arguably an element of this apparent lack of concern may be related to participants' socio-economic background, with several students commenting that they were receiving parental financial support. These individuals were aware that they could rely on their parents to assist financially if necessary; it would be interesting to explore the extent of such help in future work. Dental schools have engaged in the Government's drive to widen access to their programmes, though a significant proportion of successful applicants still originate from the higher socio-economic groups (Gallagher et al., 2009). If a greater number of students from lower socio-economic groups enter dental training, then conceivably such individuals may receive less parental financial support, which in turn may change individuals' views with regards to their worry about debt.

The difference in attitude towards debt, between those students with and without a prior degree, are also likely to become more pronounced, as students with prior degrees, in this research, undertook them at a time of relatively low tuition fees. In addition to potential additional expenses, such as mortgage payments and raising a family, several mature students commented on their reluctance to approach parents for financial assistance, as they felt guilty or embarrassed to do so.

The discussions related to accommodation, provided no clear finding in terms of progression. This was unsurprising, as it is a very context specific area, with a host of different factors involved. It is probable that many students have little choice with regards to their accommodation type, as financial or cultural pressures may require them to live at home or, conversely, some may have no alternative but to reside in rented property or halls of residence.

One accommodation factor, that had a perceived impact on progression, was the mix of different degree courses undertaken by university hall residents. Whilst living with a cross-section of students was beneficial from a social viewpoint, it was apparent that problems arose, as a result of noise and distractions from those with completely different timetables and workloads. This could be remedied by ensuring that all dental students are situated within the same university hall for example. Students' complaints about noise levels in halls of residence, were similar to those reported by Essandoh et al. (2011) and Andersson et al. (2012) and discussed in the literature review.

The disruption to sleep was of particular concern, due to the potential relationship with academic performance (Abdulghani et al., 2012). Similarly, pressure was placed on some individuals, living in the family home, to participate in social events, involving much time away from study. Education of the parents may help resolve this to an extent, however there are cultural sensitivities that would need to be considered.

5.3.8.6 Theme 6: Feelings.

Feelings including morale, motivation and stress, are inextricably linked to other themes; assessment difficulties, for example, often resulted in stress, motivation problems and the need for support. It was decided to group "feelings" into a separate theme due to the number of associated codes and consequent volume of material.

A significant topic that emerged in numerous interviews was that of de-motivation and poor morale. This was of great concern, as it appeared to have a direct effect on progression, with several students confessing to having given serious thought to leaving the programme. The literature review similarly suggested a link between forms of motivation and performance; Afzal et al. (2010) observed extrinsic motivation had a negative impact on progression and Busato et al. (2000) observed a positive association between achievement motivation and academic success. The underlying cause of these feelings appeared, in part, to be a result of bad experiences with specific staff members or the general perception of a negative atmosphere within the school. The apparent difference in atmosphere,

between campuses, may be a reflection on campus size and feelings of belongingness experienced. Students attending the relatively small outreach clinic viewed the experience very positively (as described in Section 5.3.8.1) in agreement with the observations of Radford & Hellyer (2015). Additional contributory causes, leading to de-motivation, were the mis-match between taught and assessed material, as discussed in Section 5.3.8.2, and the perception that a few poorly behaved students resulted in the whole year group being unfairly treated. This resulted in a perceived lack of support for struggling students and failure to acknowledge the conscientious, hard-working, successful individuals. The possibility of some bias being present exists, as students that volunteered to be interviewed may have had "an axe to grind" having experienced such problems. The expression of this viewpoint in several interviews however, suggests the subtheme is indeed an accurate reflection of student opinion.

The contributory causes of student stress were widely ranging, and included personal and family issues, which were unique to particular individuals. A commonly recurring stressor for all students however, was examinations, which understandably appeared to cause high levels of stress for most. The BDS5 students found clinical dentistry, specifically the requirement to achieve quotas, and administrative requirements particularly stressful. It is to be expected that clinical dentistry, which involves the students undertaking intricate procedures as well as management of the patient, would be perceived as stressful. These findings are in agreement with those of the literature review conducted by Alzahem et al. (2011), which reported the five

most commonly occurring stressors, for dental students, were accommodation issues, personal factors, educational environment, academic issues and clinical issues. It is feasible that students' stress levels could be reduced, by increasing their confidence levels with excellent, supportive chair-side teaching in all cases. Clinical staff should be reminded of the acute anxiety felt by many students, when performing clinical procedures for the first time. The theme identified the students' view that quality of chair-side teaching varied, with some individuals voicing negative experiences:

"....other tutors I found were not very good at managing that anxiety .... you're doing it on a live patient .... but some tutors are, they do come down quite hard and they say things like 'you know you should be able to do this, you should be doing this' .... it's not a helpful thing to say in front of me, in front of my patient...." (25f3B)

Time in the curriculum must be provided for students to access support services and a more proactive approach taken to identify individuals experiencing high levels of stress:

"I think we should be asked more often if we have stress because people who have stress they're not really going to speak out .... they're not going to come out and say 'I'm feeling really down about this'...." (21f3A)

6 Chapter 6. Students whose progression was of particular relevance

6.1 Students excluded from the longitudinal data analysis

Students that did not complete the first sitting of any BDS examinations were excluded from the longitudinal data analysis, as detailed in Section 3.2.2. This section will explore these individuals further, using the questionnaire and interview data where possible.

The 16 students who withdrew from their programme, or had their studentship terminated, did not participate in the questionnaire or interview stages (Table 9). Similarly the five C1 (5-year programme) students who deferred the first sitting of an examination (Table 9) did not participate, however all successfully passed their second examination sitting. The one individual excluded from C3 (GPEP) also graduated prior to the questionnaire and interview stages.

6.1.1 Students excluded from C1 and C3

The 18 students excluded from C1 comprised 12 (66.7%) females and 6 (33.3%) males, of whom four (22.2%) had white ethnicity and 14 (77.8%) non-white (Table 56). The median age (in the June following admission) was 19.7 years (range 18.7 – 35.7). UKCAT percentile scores were available for 12 (66.7%) individuals and ranged from 50 to 95 (median 75.5).

Table 56. Demographic information for the students in C1, C2 (5-year programmes) and C4 (GPEP) who were excluded from the longitudinal analysis. The percentage figure in brackets represent the proportion of the total number of students excluded from the longitudinal analysis, in each cohort.

		C1	C2	C4
Gender	Female n (%)	12 (66.7)	16 (55.2)	2 (66.7)
	Male n (%)	6 (33.3)	13 (44.8)	1 (33.3)
Ethnicity	White n (%)	4 (22.2)	7 (24.1)	1 (33.3)
	Non-white n (%)	14 (77.8)	19 (65.5)	2 (66.7)
	Unknown n (%)	0 (0.0)	3 (10.4)	0 (0.0)
Age (June after admission)	Mean (SD)	21.4 (4.9)	20.2 (2.6)	22.7 (0.5)
	Median (min, max)	19.7 (18.7, 35.7)	19.5 (18.8, 32.5)	22.8 (22.2, 23.2)
UKCAT (Percentile scores)	Available scores n (%)	12 (66.7)	22 (75.9)	3 (100.0)
	Mean (SD)	74.8 (14.9)	74.1 (20.7)	47.3 (22.3)
	Median (min, max)	75.5 (50, 95)	81.5 (27, 97)	36 (33, 73)

Of the 18 C1 students excluded from the longitudinal analysis, eight were in BDS5 during the questionnaire and interview stages, the remaining 10 having graduated or left the programme (Table 9). Of these eight, seven completed a questionnaire and one also participated in a one-to–one interview (Table 57).

One student was excluded from C3 (GPEP) due to lack of examination data at the time of analysis. This individual successfully graduated with his/her peers in 2012 and so will not be considered further.

Analysis of the questionnaires completed by the two intercalating individuals in C1 revealed little of note.

Table 57. Number of students, in C1, C2, C3 and C4, who participated in the questionnaire and interview stages. The percentage figure in brackets represent the proportion of the total number of students excluded from the longitudinal analysis, in each cohort, eligible to participate in the questionnaire and interview stages.

	C1	C2	C3	C4
Number eligible to participate in the questionnaire and interview stages	8	20	0	1
Number that completed the questionnaire (%)	7 (87.5)	18 (90.0)	0 (0.0)	0 (0.0)
Number that participated in interview (%)	1 (12.5)	0 (0.0)	0 (0.0)	0 (0.0)

The five questionnaires completed by C1 students, who re-sat a year or took a year-out, established "a greatly contributing factor" was "health problems" for three students and "family problems" for one. These observations were in agreement with the interview comments made by the C1 excluded student; they explained poor health was the primary reason for their progression difficulties. They also struggled during BDS1 with family illness, living away from home and difficulties balancing social life with academic pressures:

"....ever since then I've consistently struggled every year in terms of, in all aspects of doing the degree, um, attending, academics, like learning stuff...." (5o6)

The student considered leaving the programme, however praised the support received from KCLDI which encouraged them to persist:

"....I found generally everyone is very, very understanding and very supportive and flexible for me...." (5o6)

Four of the seven (57%) students completing a questionnaire scored the "worry about debt" question a three or four (four indicating a "significant

effect on studies") and one individual scored 34 on the perceived stress scale (PSS), which was the fourth highest score in that BDS5 cohort.

6.1.2 Students excluded from C2 and C4

The 29 students excluded from C2 comprised 16 (55.2%) females and 13 (44.8%) males, of whom seven (24.1%) had white ethnicity and 19 (65.5%) non-white, with three (10.4%) withholding the information (Table 56). The median age, in the June following admission, was 19.5 years (range 18.8 - 32.5). UKCAT percentile scores were available for 22 (75.9%) individuals, and ranged from 27 - 97 with a median of 81.5 (Table 56).

The three students excluded from C4 comprised two females and one male with a median age of 22.8 years (range 22.2 – 23.2) (Table 56). One student had white ethnicity and two non-white. UKCAT percentile scores ranged from 33 - 73 (median 36.0).

Of the 32 C2 and C4 students excluded from the longitudinal analysis (Table 9) 21 were in BDS5 during the questionnaire and interview stages and 18 (85.7%) completed a questionnaire, though none participated in a one-to–one interview (Table 57).

Of the five students who undertook an intercalated degree, three (60%) were female and four (80%) of non-white ethnicity. One individual commented that intercalating:

"Helped with motivation, doing something completely different for a year".

Ten students in C2 repeated a year of study, with eight (80%) completing a questionnaire. Of these eight, seven (87.5%) gave “family reasons” as being a “greatly contributing factor” and three (37.5%) gave “health reasons”. Four individuals deferred the first sitting of an examination, three (75%) of whom completed a questionnaire. Two scored “health” as “a greatly contributing factor”.

Analysis of the 18 completed questionnaires observed two students (11.1%) scored the “worry about debt” question a three or four (four indicating a “significant effect on studies”). One individual scored 35 on the perceived stress scale (PSS) and one scored six, which were the third highest and lowest scores, respectively, in their BDS5 cohort.

6.2 Students included in the longitudinal analyses, of particular relevance

The longitudinal analyses included students of particular relevance to this research, such as those students who remained in the bottom or top thirds throughout their programme.

6.2.1 Individuals who remained within the bottom third of the longitudinal analyses throughout their programme

The C1 and C2 analyses (5-year programmes combined) observed 16 (7.4%) students remained in the bottom third of their cohorts as they progressed from BDS1 to BDS5. Eight students were male and eight female, with 15 (93.8%) of non-white ethnicity (Table 58). The C1 and C2 students,

in the bottom third, had a median age of 19.4 years (range 18.8 – 27.4) in the June following admission.

UKCAT percentile scores were available for 13 (81.3%) of the C1 and C2 students in the bottom third, and ranged from 45 to 89 (median 72.0) with six (46.2%) scoring in the 80th percentile (Table 59). Three students completed a questionnaire; all had failed an end of year examination, with two citing "health problems" as a "greatly contributing factor". One student participated in a focus group, and explained long hours of paid work contributed to their examination failure, with lack of motivation also contributing.

The C3 and C4 analyses (GPEP cohorts combined) observed nine (15.3%) students remained in the bottom third of their respective cohorts as they progressed from BDS2 to BDS5. Two (22.2%) students were male and seven (77.8%) female, with all of non-white ethnicity (Table 58). The students had a median age of 23.3 years (range 21.9 – 40.2) in the June following admission. UKCAT percentile scores were available for 7 (77.8%) of the C3 and C4 students in the bottom third, and ranged from 40 to 97 (median 75) (Table 59). Four C4 students completed questionnaires; all had failed an end of year examination with each citing "family problems" as being a contributory factor. "Relationship problems" was also a "greatly contributing factor" for two and "health problems" for one. Two students participated in one-to-one interviews, which confirmed one had significant on-going health problems throughout their programme and one had complex family pressures.

Table 58. Demographic information for the students in C1 and C2 (5-year programme) and C3 and C4 (GPEPs) who remained in the bottom third of their respective cohorts from beginning to end of their programme. The percentage figure in brackets represent the proportion of the total number of students remaining in the bottom third, in each cohort.

		C1	C2	C3	C4
Gender	Female n (%)	6 (60.0)	2 (33.3)	3 (75.0)	4 (80.0)
	Male n (%)	4 (40.0)	4 (66.7)	1 (25.0)	1 (20.0)
Ethnicity	White n (%)	0 (0.0)	1 (16.7)	0 (0.0)	1 (20.0)
	Non-white n (%)	10 (100.0)	5 (83.3)	4 (100.0)	4 (80.0)
Age (June after admission)	Mean (SD)	20.4 (2.6)	19.5 (0.6)	22.4 (0.6)	27.7 (7.2)
	Median (min, max)	19.4 (18.8, 27.4)	19.5 (18.8, 20.3)	22.2 (21.9, 23.3)	25.7 (21.9, 40.2)
UKCAT (Percentile scores)	Available scores n (%)	7 (70.0)	6 (100.0)	2 (50.0)	5 (100.0)
	Mean (SD)	67.4 (19.1)	77.5 (10.0)	76.0 (1.4)	66.4 (24.4)
	Median (min, max)	59 (45, 89)	77.5 (66, 88)	76 (75, 77)	57 (40, 97)

Table 59. Range of UKCAT scores, means and medians for students remaining in the bottom or top 1/3 as they progressed from beginning to end of their programmes (for C1 and C2 combined and C3 and C4 combined). The percentage figure in brackets represent the proportion of the total number of students in the bottom third or top third of each combined cohort.

	C1 and C2 (5-year)		C3 and C4 (GPEP)	
	Bottom 1/3	Top 1/3	Bottom 1/3	Top 1/3
Available scores n (%)	13 (81.3)	19 (86.4)	7 (77.8)	5 (100)
Mean (SD)	72.1 (15.8)	71.5 (19.5)	69.1 (20.5)	76.4 (15.3)
Median (min, max)	72 (45, 89)	68 (37, 98)	75 (40, 97)	78 (53, 96)

6.2.2 Individuals who remained within the top third of the longitudinal analyses throughout their programme

The C1 and C2 analyses (5-year programmes combined) observed 22 (10.2%) students remained in the top third of their respective cohorts as they progressed from BDS1 to BDS5. Seven students were male and 15 female, with 19 (86.4%) of non-white ethnicity (Table 60). The students, in the top third, had a median age of 19.3 years (age range 18.8 – 20.5) in the June following admission.

UKCAT percentile scores were available for 19 (86.4%) of the students and ranged from 37 to 98 (median 68) with six (31.6%) scoring in the 90th percentile (Table 59).

Ten (90.9%) of the students, in the top third of C2, completed a questionnaire and two (18.2%) participated in a focus group. Analysis of the questionnaires observed nothing of note, except one interesting comment related to social distractions:

"Pressure from flatmates to go out and socialise during revision/exam periods. I need to work hard for a long time without social distractions to achieve good grades"

The focus groups included discussions related to the importance of good peer support, clinical partners and tutor groups:

"….it's also important to be in a group of people who you feel …. confident …. being around so you're more …. likely to voice your opinion in tutorials …. without feeling embarrassed…." (5f1B)

Table 60. Demographic information for the students in C1 and C2 (5-year programme) and C3 and C4 (GPEPs) who remained in the top third of their respective cohorts from beginning to end of their programme. The percentage figure in brackets represent the proportion of the total number of students remaining in the top third, in each cohort.

		C1	C2	C3	C4
Gender	Female n (%)	6 (54.6)	9 (81.8)	2 (100.0)	1 (33.3)
	Male n (%)	5 (45.5)	2 (18.2)	0 (0.0)	2 (66.7)
Ethnicity	White n (%)	1 (9.1)	1 (9.1)	2 (100.0)	3 (100.0)
	Non-white n (%)	9 (81.8)	10 (90.9)	0 (0.0)	0 (0.0)
	Unknown n (%)	1 (9.1)	0 (0.0)	0 (0.0)	0 (0.0)
Age (June after admission)	Mean (SD)	19.5 (0.5)	19.2 (0.29)	24.5 (3.4)	23.0 (0.6)
	Median (min, max)	19.3 (18.9, 20.5)	19.2 (18.8, 19.7)	24.5 (22.1, 26.9)	23.1 (22.4, 23.6)
UKCAT (Percentile scores)	Available scores n (%)	9 (81.8)	10 (90.9)	2 (100.0)	3 (100.0)
	Mean (SD)	75.3 (20.2)	68 (19.4)	78.0 (0.0)	75.3 (21.6)
	Median (min, max)	74 (42, 97)	64 (37,98)	78 (78, 78)	77 (53, 96)

The C3 and C4 analyses (GPEP cohorts combined) observed five (8.5%) students remained in the top third of their cohorts as they progressed from BDS2 to BDS5. Two (40.0%) students were male and three (60.0%) female, with all of white ethnicity (Table 58). The students had a median age of 23.1 years (age range 22.1 – 26.9) in the June following admission.

UKCAT percentile scores were available for all five of the C3 and C4 students in the bottom third, and ranged from 53 to 96 (median 78) (Table 59). Three questionnaires were completed, though analysis observed nothing of note.

6.2.3 Progression from preclinical to clinical study

Analysis of the 72 C1 and C2 students (5-year programmes combined) who were in the bottom third for their BDS1 examinations, observed 51 (70.8%) remained in the bottom third for their BDS2 examinations. 35 (48.6%) in the bottom third for BDS1 were also in the bottom third for their final BDS5 examinations (Table 61).

Table 61. Proportion of students in C1 and C2 (combined) who remained in the bottom and top thirds for both BDS1 and BDS2 examinations, and for BDS1 and BDS5 examinations. The percentage figure in brackets represent the proportion of the total number of students who started in the bottom (or top) third, in the C1, C2 combined cohort.

	Number (%)
Students in the bottom third for BDS1 who remained in the bottom third for BDS2	51 (70.8)
Students in the bottom third for BDS1 who were also in the bottom third for BDS5	35 (48.6)
Students in the top third for BDS1 who remained in the top third for BDS2	50 (69.4)
Students in the top third for BDS1 who were also in the top third for BDS5	37 (51.4)

Analysis of the C1 and C2 students in the top third during BDS1, observed 50 (69.4%) remained in the top third for their BDS2 examinations and 37 (51.4%) were in the top third for their final BDS5 examinations (Table 61).

6.3 Discussion

Examination of the demographic data for the students who were excluded from the longitudinal analyses did not establish any common themes. The proportion of females excluded from C1 and C2 (66.7% and 55.2% respectively) were similar to the proportion of females in C1 and C2 as a whole (58.1% and 59.4% respectively). Similarly the proportion of students, of non-white ethnicity, excluded from the C1 and C2 analyses (77.8% and 65.5% respectively) were similar to the proportion entering the C1 and C2 programmes (76.7% and 77.4% respectively).

It is probable that the eight students whose studentship was terminated lacked mitigating circumstances; they may simply have struggled to cope with the academic nature of the programme or did not apply themselves to university study.

A smaller proportion of the GPEP cohort (3%) withdrew from their programme compared to those on the 5-year programme (5.3%) (Table 9), which was similar to the observation of Arulampalam et al. (2007) who reported graduates to be 2.4% less likely to drop out from their studies compared to those with just A-levels. It was not possible to determine the cause of attrition from KCLDI, however the eight individuals who withdrew may have done so for personal reasons or because they felt dentistry was not the correct career choice. Suggested causes of attrition described in the literature, include the wrong choice of study (Yorke, 2000), not seeking support (Pitt et al., 2012), and not living locally during holiday periods (Wray

et al., 2012). A recommendation would be to undertake a prospective study involving exit interviews of students who leave the programme, to determine the exact causes.

Health and family problems appeared the most common reason for students resitting a year or deferring end-of-year examinations. This was in agreement with Ballard et al. (2015) who explained personal reasons and health to be responsible for 14 of the 27 cases of dismissal from an American Dental School. The factors associated with the need to repeat a year, such as health, may be on-going. The importance of providing close support for repeaters, throughout their studies, is evident. Suggestions of ways in which these struggling students could be helped are made in Section 8.1.

Analyses of the students remaining in the top third revealed little of note. One interesting observation was the median UKCAT scores of students, who remained in the top third throughout their programme, were similar to those that remained in the bottom third; the combined C1 and C2 median scores for those in the bottom third was slightly higher than the scores of those in the top third (72.0 and 68.0 respectively, Table 59). This would suggest that UKCAT scores offered no prediction of students' progression as a KCLDI undergraduate, similar to the earlier observation (Section 4.2.4.4) of a non-significant, weak Pearson's correlation ($r = 0.18$, $p = 0.06$) between UKCAT and BDS5 scores, for the 5-year programme.

It is a reasonable presumption that students remaining in the bottom third of their cohort, as they advance through their programme, are those most at risk of progression difficulties. This was evidenced by the proportion of students (48.6%) in C1 and C2, in the bottom 1/3 of their cohorts in BDS1, who were also in the bottom 1/3 in BDS5. The observation was in agreement with the weak to moderate Pearson's correlations, between BDS1 and BDS5 examination results, reported in Section 3.2.6.1. The ranking process, developed in this research, could be used to identify these "at-risk" students at an early stage in their progression, such that relevant support can be provided. It is conceivable that such individuals may otherwise "scrape" a pass in end-of-year examinations and go un-noticed until problems reach an advanced stage.

7 Chapter 7. Summary and conclusions

7.1 Summary

This research was designed to investigate the manner in which KCLDI students progressed through their undergraduate dental programme and to determine factors perceived to influence this progression. These aims were achieved, with the findings used to inform policy makers within the Institute.

The methodology, using mixed methods and both qualitative and quantitative stages, proved to be a valid and valuable approach, allowing a degree of triangulation (Denscombe, 2010). Similarly, the sequential approach proved beneficial, as completion of the longitudinal analysis and questionnaire strands first (which produced predominantly quantitative results) allowed deep probing of the findings, during the qualitative focus group and interview stages (Ritchie & Ormston, 2014).

The longitudinal analysis appeared unique, with no comparable ranking and analysis of dental students' progression found during the literature search. It proved to be an effective means of determining the manner in which students progressed through their programmes, relative to their peers. Two methods were used to divide the ranked students, with division into thirds found more beneficial than division into halves in answering the research questions and recommended for future work of this nature. Division into halves, though producing worthwhile and interesting results, proved less informative being more of a blunt instrument.

The questionnaire used on the first cohort (Q1) proved an effective tool in answering the research questions. The design was successful, necessitating only minor modifications prior to use on the second cohort (Questionnaire 2, Q2). This demonstrated the value of undertaking pilot focus groups during the development stage (Kitzinger & Barbour, 1999). Repeating the questionnaire stage with a second academic year group increased reliability, with the results of the second group very similar to those of the first. The focus group and interview stage similarly helped answer the research questions effectively. The interviewees were representative of the year group and included a mix of all abilities, including some who had failed examinations and re-sat years. The approach taken was transparent, enabling a degree of generalizability to other dental schools.

Not all students starting the dental programme graduated successfully. The longitudinal analysis strand involved two intakes of 5-year programme students and two intakes of GPEP students. From these intakes, totalling 325 students, eight (2.5%) failed examinations and had their studentship terminated and eight (2.5%) withdrew from the programme. Analysis of demographic and admissions data failed to determine any significant factors common to these individuals. Adam et al. (2014) reported similar figures, in their five-year longitudinal cohort study of UK Medical students, with 11 (8%) leaving the programme prematurely.

The remaining students progressed to graduation, though not necessarily at the same rate as their peers; 18 (5.5%) re-sat a year of study or took a year

out. Analysis of demographic and admissions data again failed to establish any common factors linking these individuals. Progression of the remaining students was not smooth, in many cases, with BDS5 questionnaire data reporting approximately one third having failed at least one end-of-year BDS examination during their programme.

Todres et al. (2012) failed to establish a link between the need for UK medical students to re-sit examinations and health, money or other social factors, however both questionnaires in this research established that “family problems” was the most commonly cited reason for having to resit an end-of-year examination. The exact nature of these family issues naturally varied considerably from individual to individual; caring for a seriously ill parent and the death of a close relative shortly before the examination were two examples given during the interview stage of this research. This observation was similar to that of Ballard et al. (2015) who showed “personal reasons” followed by “academic factors” to be the most common reasons for dismissal of students from an American dental school, over a ten-year period. Whilst students may have been understandably unwilling to divulge details during this research, the finding illustrated the need for excellent pastoral support. It became apparent in the interviews however, that some individuals had been reluctant to seek such help, illustrating the need for the university to be more proactive in the nature of the pastoral care provided. The large proportion of students living in the parental home, at the point of questionnaire completion, (32.0%, n = 70 of BDS1 and 32.3%, n = 87 of BDS5 for Q1, Q2 combined) may also have relevance. It is reasonable to presume that any underlying

“family problems” would have more of an impact for such individuals. This has similarities to observations made in other work. Students living with parents have been reported to have higher stress scores (Muirhead & Locker, 2008) and an increased likelihood of failed final examinations (Woolf et al., 2013). A higher proportion of drop-outs from medical school have also been observed among students living off-campus (Arulampalam et al., 2007).

The second most commonly cited reason for resitting an examination, in Questionnaire 1, was “health problems”. During the interview stage for example, one student discussed the effect severe anxiety had on his/her studies; teaching students appropriate coping skills, such as time management techniques, may prove invaluable in such cases. Whilst health problems are largely unavoidable, it again demonstrated the importance of excellent pastoral support, such that adverse effects on progression are minimised.

The second most commonly cited reason for resitting an examination, in Questionnaire 2, was “teaching and learning issues”. Discussions concerning teaching and learning issues formed a significant proportion of the interviews, with “the dental programme” and “study and supporting study” being the two largest resulting themes. Small group tutorials and chairside teaching were the teaching methods rated most highly by students in the questionnaires, with interviews establishing that this was due, in part, to being able to ask questions and influence the topics of discussion. The interviews established however, that the make-up of the students within the

small groups was of great importance, such that individuals felt able to participate freely. The role of the teacher in this regard is of critical importance, to ensure no student feels excluded or unable to have their voice heard. Smaller groups are likely to promote a sense of belongingness, with students expressing a great enthusiasm for outreach teaching for that reason (Radford & Hellyer, 2015).

Additional teaching and learning issues, perceived to affect progression, included teachers who were weak or unapproachable, inadequate feedback following examinations, lack of clarity concerning the breadth and depth of study required and a mis-match between taught and assessed material. The students' views on teacher characteristics were in agreement with those of dental students in America (Jahangiri et al., 2013 and Victoroff & Hogan, 2006) and New Zealand (Anderson et al., 2011). Ensuring assessment is developed in conjunction with pedagogy, as advocated by Kinchin et al. (2008b), would help address students' assessment concerns.

Work on medical students conducted by Sartania et al. (2014), Husbands et al. (2014) and Tiffin et al. (2016) showed UKCAT to offer some predictive ability of student performance in the later stages of their programmes. This work showed a weak positive correlation ($r = 0.18$, $p = 0.06$) between the UKCAT scores of 5-year programme students and their BDS5 examination scores and conversely a weak negative correlation ($r = -0.18$, $p = 0.46$) between GPEP's UKCAT and BDS5 scores, though in both cases these were non-significant. A weak to moderate positive, statistically significant

correlation was observed between BDS1 and BDS5 examination performance, which was in agreement with the longitudinal study of UK medical students conducted by Adam et al. (2015). A weak negative correlation was also observed between BDS5 scores and DF1 ranks ($r = -0.24$, $p = 0.01$) indicating that students who performed better at BDS5 also performed better at DF1 interview.

Despite these correlations, the longitudinal analysis showed the performance of the majority of KCLDI students, relative to their peers, fluctuated during progression through their programme. This was observed both for the overall end-of-year examination score and the component parts of the examinations. These fluctuations were large in some cases; of the 37 C1 students who were in the middle third at BDS1, the average change in rank, when comparing BDS1 to BDS5, was 32 places (range of change in rank: 0 to 59). Such fluctuations possibly support the constructivist models of learning, with students actively making sense of new knowledge and their performance going up and down as a result (Gipps, 2012). Similarly the pathway from novice to competent to expert is not linear (Chambers et al., 1996) and this finding supports the need to consider knowledge and acquisition of clinical skills performance simultaneously (Chambers, 1998).

The strongest correlation for examination component part scores was seen between the BDS2 C3 (GPEP) in-course assessment and the BDS5 OSCE. This indicated that only about 44% of the variance was accounted for, with about 56% unaccounted for and due to other factors. Weaker correlations

were seen between all the other assessments, with a correspondingly higher level of unaccounted variance. More than 70% of the variance was unaccounted for in the case of the overall examination scores (with all the component part scores added together) between the beginning and end of the programmes. The questionnaire and interview stages determined students' perceptions of the factors influencing progression, and thus potentially contributing to this unaccounted variance and the fluctuations in rankings. These factors proved to be of a complex and multiple nature, in agreement with Ballard et al. (2015) who concluded 64% of the variation they observed in dental school academic performance was not accounted for by admissions criteria, but possibly due to factors such as personalities and life events.

Questionnaire scores, related to accommodation factors, were low in most cases, indicating little perceived hindrance to study. Social distractions received the highest scores, with 89 (18.1%) respondents, across both questionnaires, indicating they were a significant hindrance. Interviewees identified numerous distractions, for example some living within the parental home were expected to take an active role in family celebrations lasting several days. Participants in university dance or sporting societies discussed the need to undertake frequent training sessions, sometimes with little notice. While students were aware of the importance of obtaining a balance between social life and study, some struggled to do so.

Debt levels were high; 122 (46.9%) BDS5 students had debts of £20,000 or more (excluding tuition fees, Q1, Q2 combined). Most students did not appear worried about their debts, explaining they believed they would be readily serviced following graduation. This was not the case for all however, with worry about debt having a “significant effect on studies” for 19 (7.0%) BDS5 students (Q1, Q2 combined). The older students in particular appeared most worried about debt, scoring highest for this question. Students aged over-24 were also the age-band containing the greatest proportion undertaking paid work and scored highest on the “effect of paid work on study” question. Interviews with older students revealed some complex financial circumstances, including debts from previous degrees, mortgages and family expenses.

The questionnaire results from BDS1 and BDS5 were similar in most cases, though BDS5 Perceived Stress Scale (PSS) scores were significantly higher and BDS5 had understandably higher levels of debt. Perceived stress levels were high, for both year groups, in agreement with other dental student studies (Elani et al., 2014), with females scoring significantly higher than males. Regression analysis also observed significantly increased PSS scores for students who felt that their studies were hindered by journey difficulty, family responsibilities, social distractions and worrying about debt. The relationship between stress and academic performance has produced conflicting results in the literature (Elani et al., 2014) with PSS scores in this research not predicting student performance at end-of-year BDS examinations. Additional common stressors, identified during interviews,

included examinations and clinical issues. The student-reported conflict between academic and clinical factors was a particular stress for some in BDS5, where meeting clinical quota requirements, in the approach to finals examinations, was perceived to hinder their ability to revise for academic examinations. These stressors were very similar to those identified in the literature review conducted by Alzahem et al. (2011).

A regression model using combined data from Q1 and Q2, with gender, perceived stress scale scores, accommodation factors and debt worries as explanatory variables, identified no predictors of examination performance.

The literature review identified the transition between school and university as being a particularly important and potentially difficult period for students (Pittman & Richmond, 2008 and Hussey & Smith, 2010). The research confirmed this, with the “change in volume of work”, compared to school, perceived by BDS1 students as causing difficulties. Interviews identified several additional factors impacting upon progression, associated with this transition period. These included the time spent making new friends and learning how to undertake domestic tasks.

Few differences between the 5-year programme and GPEP students’ views, on progression, were observed during the interview stage. The 5-year students did however perceive GPEPs to have better developed organisational and time-management skills, a more relaxed manner and increased confidence when communicating with patients. Many GPEPs

described complex personal issues, however, including high debt levels and family responsibilities, as outlined above.

The questionnaire results were analysed by gender and results were very similar, with the exception of PSS scores, as outlined above. Analysis of the interviews similarly identified only two explicit mentions concerning gender, suggesting students do not perceive this as being a factor affecting progression. This was supported by the results of the general linear (random effects) model, which showed student gender did not predict performance in the end-of-year BDS academic assessments. The model also showed ethnicity did not predict performance in the end-of-year assessments of a clinical nature, such as OSCEs. Similarly analysis of age bands observed little difference in questionnaire results, with the exception of financial factors, as outlined above. The PSS scores of the under-20 group were the lowest of the age-bands, though this group were all in BDS1, a non-clinical year, potentially explaining the observation.

It is probable that KCLDI students' progression was also influenced by additional factors identified within the literature review, such as personality. Both a positive (Woolf et al., 2013 and Adam et al., 2015) and negative (Ferguson et al., 2003 and Ferguson et al., 2014) relationship has been observed between medical student performance and conscientiousness for example. Though students' personality traits were not explicitly determined in this research, some aspects were alluded to during the interviews. A few interviewees described a disorganised approach to organisational tasks

among their peer group, for example, leading to difficulties obtaining clinical quotas. Ferguson et al. (2014) explained that lower levels of conscientiousness were associated with disorganisation and possible reduced performance.

In distilling the data analysed during this research, one overarching factor became apparent, during the interview stage, as being crucial to student progression; the nature of the interactions between students and their peers and between students and staff.

Students appeared to have utilised peer support effectively and this was greatly helped by technology such as social media. Some individuals however received less peer support than others, for example those living in homes involving a long journey time to University. Peer support must be encouraged, with the University continuing to provide appropriate resources such as communal study areas. Students should be encouraged to discuss problems and concerns at an early stage such that appropriate support can be provided.

The interviews highlighted examples of inadequacies from some staff, ranging from poor communication to ineffectual teaching and pastoral support. Many of the areas identified as influencing progression, including student morale, motivation, stress, support, teaching, learning and assessment could potentially be addressed by ensuring the staff interacting with students are those best suited and with the appropriate skill sets to do

so. Staff must have appropriate training and support, by engaging in peer review of teaching schemes for example (Cunningham & Lynch, 2016). Staff must ensure teaching sessions lead to learning, assessed material reflects what has been taught (Kinchin et al., 2008b), and that they are approachable, so if students do not understand or have any concerns they can speak-up. Staff must provide excellent pastoral care (Manogue et al., 2011) and be aware of the diverse nature of the student body and the different needs of individuals. Such an approach will also help foster a sense of belongingness and assist with the transition from school to university and from university to life outside.

The vast majority of students entering KCLDI progress through their programme of study and successfully graduate, with most entering DF1 training posts. This study demonstrated the importance of recognising that whilst generalisations can be made, students must be treated as individuals, with unique challenges and needs. For many, progression through their dental programme was neither easy, nor without cost to their wellbeing. It is thus imperative that KCLDI recognises and addresses any factors contributing to progression difficulties and equips students with appropriate coping mechanisms to take into their future professional lives. Dissemination of results from this research will assist policy makers in achieving that goal.

7.2 Conclusions

The end-of-year BDS examination performance of the majority of students, relative to their peers, fluctuated as they progressed through their programme with a small proportion remaining in the top or bottom third of their cohort throughout.

A weak to moderate correlation existed between performance at beginning and end of the programmes, however most of the variance was unaccounted for. We sought to account for the unaccounted variance in the qualitative analysis, which identified the interactions between students and the people surrounding them as being a crucial factor influencing progression. These interactions were of both a positive and negative nature, with the academic and pastoral support offered by peers, teachers and parents being of particular importance to students. Similarly, students who failed an end-of-year examination most commonly cited family problems as being a greatly contributory cause.

The difference in volume of work between school and university was perceived by students as causing difficulties, though worry about high levels of debt did not and students rated tutorial and chairside teaching highly.

Perceived stress scale scores were high though a regression model with gender, perceived stress scores, accommodation factors and debt worries as explanatory variables, identified no predictors of examination performance.

8 Chapter 8. Recommendations and future work

8.1 Recommendations

A number of recommendations can be suggested, which if implemented may help student progression.

8.1.1 Transition from school

The transition from school to university often poses many difficulties for students and it is important that individuals rapidly feel a sense of belonging to the KCLDI community. A recommendation would be to seek ways in which to develop this process. The work of Radford & Hellyer (2016) involved final-year students, however their suggestions could be applied to students entering the programme, for example encouraging all members of staff, including administrators, to generate a sense of belongingness. It is also important that this process is ongoing, as Hausmann et al. (2007) reported a decline in students' sense of belonging as the academic year progressed. A more personalised "buddy scheme" is recommended. Interactions on both a social and academic level help develop a sense of belonging (Glass & Westmont, 2014) and so matching individuals more closely, according to shared interests or hobbies for example, may help. It is important that the buddies are enthusiastic and they should receive effective training about how to advise and help struggling mentees. Early clinical exposure is valued by students and appears to help with motivating individuals and developing the sense of belonging and so a recommendation would be to continue this.

8.1.2 Atmosphere

A recurring theme, from both BDS1 and BDS5 students was the “negative atmosphere” experienced, as a result of unfriendly or unhelpful interactions from some staff. Such an atmosphere will not help BDS1 students develop a sense of belonging, as teachers perceived as being encouraging, enthusiastic, friendly, helpful, organized and well prepared engender a greater sense of belonging amongst their students (Freeman et al., 2007). A recommendation would thus be to attempt to break down some of the perceived barriers between staff and students, such that teachers appear more approachable. Identification of staff perceived to be hostile or unfriendly is needed and an attempt made to keep these individuals at arms-length from students, ensuring for example they do not become personal tutors.

Radford & Hellyer (2016) discussed the importance of developing collegiality, with small group sizes and students taking ownership of their clinical environment helping to foster a sense of “togetherness”. At KCLDI the recent introduction of the Team structure, described in Section 5.3.8.1, may well help develop a similar sense of community. There were anecdotal discussions that this had occurred. It is possible that extending the Team structure into BDS1 and perhaps giving first year students more exposure to the clinical staff may help also.

8.1.3 Accommodation

The KCLDI students are not typical of most KCL students, due to the intense nature of their programme, often involving long working days. The literature

observed noise within halls of residence to be a cause of study and sleep disturbance (Essandoh et al., 2011). Interviews in this study established a range of additional difficulties encountered by students in relation to their accommodation; for example social distractions, an inability to return to catered halls of residence in time for an evening meal, or being unable to access online course material due to poor WiFi connectivity. A recommendation would be to the halls of residence to carefully consider the specific requirements of dental students, as they may differ markedly from those of others.

8.1.3.1 Social distractions

Social distractions were identified by students as a key issue affecting progression. Individuals living within university halls of residence explained that students on other programmes were often a significant problem, as they followed very different timetables. There is no easy solution; grouping dental students together at halls might to some extent alleviate this, though they would then have a very protected university experience, which is probably inadvisable. Holdsworth (2006) observed students who lived at home, with a journey time to college of over 30 minutes, enjoyed their social life less. During the interviews conducted in this PhD research, students living at home identified pressures applied by parents to socialise, for example the expectation to become deeply involved with the organisation of family gatherings. A recommendation would involve attempting to educate parents with regards to the pressures faced by dental students; a lecture, for

example, could be delivered to parents of new students, highlighting relevant issues.

8.1.4 Support

The research established that many students felt well supported by KCLDI, however some were unaware of the services offered or lacked confidence to approach individuals for help. This was similar to the observation of Wilcox et al. (2005) that some students who had withdrawn from university found difficulties approaching their personal tutors. A recommendation would thus be to develop the support network further, involving a more proactive approach; students need to be identified and approached at an early stage if it is felt there may be problems. All support services should be advertised at regular intervals and efforts made to break down any stigma surrounding areas such as counselling or mental health services. Students that have accessed such services could be involved in this process by "telling their story" if they were prepared to do so, thus strengthening peer support. In the survey of American dental students conducted by Burk & Bender (2005), informal peer support was observed to be more effective than other internal support measures.

8.1.4.1 Personal tutors

The number of personal tutees looked after by each tutor should be reduced, enabling a more personal approach to be taken. Many personal tutors were described in very positive terms by students, however this was not universally the case. Wilcox et al. (2005) similarly observed some students

who had withdrawn from university had experienced difficulties with their personal tutors. A recommendation would be for great care to be taken in the appointment of tutors, ensuring they are approachable. These appointments may need to be more personalised, with certain personality types of students perhaps better suited to certain personality types of tutor. Similarly it became apparent during the research, that GPEPs often have more complicated personal lives, with significant family and financial commitments for example. The pastoral needs of GPEPs therefore often differ from those of other students and personal tutors need to be aware of this and how best to support them.

The tutors need to be fully committed to their role and develop a relationship with their tutees, by holding one-to-one meetings and regularly contacting students to check on their needs. The tutors need to be aware of the great importance of their role and receive appropriate training as well as being accountable for their activities, by for example logging all interactions with their tutees.

8.1.4.2 Stress

The levels of perceived stress recorded were high. A recommendation would be that appropriate stress-management programmes are developed and incorporated into the curriculum and repeated in all years of study. Staff should also receive training on how to identify students that are becoming unduly stressed and how they can help them. The literature review highlighted a range of stressors associated with dental students, including

low teacher support (Muirhead & Locker, 2008), accommodation issues, personal factors and educational environment (Alzahem et al., 2011) with social support being negatively associated with stress (Gambetta-Tessini et al., 2013). Thus many of the recommendations described above may help facilitate a reduction in student stress.

8.1.5 Teaching and learning

8.1.5.1 Teachers

American dental students considered effective learning was facilitated by positive teacher characteristics, including approachability, willingness to give feedback, enthusiasm and patience (Victoroff & Hogan, 2006). Similarly, New Zealand dental students felt learning was facilitated by approachable, non-confrontational and engaged staff (Anderson et al., 2011). Such characteristics need to be nurtured within all teaching staff at KCLDI, with appropriate support and training provided. Students should be given the opportunity to regularly provide feedback on the quality of teaching provided by their supervisors, as this has been demonstrated to lead to improvements in clinical teaching (Youngson et al., 2008).

8.1.5.2 Tutorials

The tutorial format was clearly favoured by students and so a recommendation would be to ensure these continue to be effective and ideally developed further. To achieve this will involve maintaining time and space within the curriculum and ensuring resources such as rooms and audio-visual aids are available.

8.1.5.3 Examinations

Conflicting information from tutors with regards to examination content was a recurring theme. A recommendation would be to ensure Heads of Discipline are responsible for communicating, both to staff and students, the correct information pertaining to this.

Individuals involved with resitting examinations spoke of a feeling of a lack of support during preparation for their resits. A lack of feedback, with regards to where they went wrong, and a sense of being “left to get on with it” were described. Yorke (2000) made a similar observation that struggling students, taking clinical and pre-clinical subjects, lacked support. A recommendation would thus be to provide increased support for these individuals; a simple lack of study did not appear to be a common factor in the reason for failure, but more often a mixture of issues such as health and family problems, suggesting close support is essential.

8.1.6 Finance

The research established that students were accumulating large levels of debt, however most did not appear concerned about this. The cost of living in London is also high compared to other parts of the UK and a recommendation would be to closely monitor students’ levels of concern about debt. KCLDI needs to be in a position to identify and help students struggling financially and consider offering further financial support to those in great need, not least because personal debt may contribute to mental health problems (Fitch et al., 2011).

8.1.7 At-risk students

The research identified certain groups of students potentially at greater risk of progression difficulties, including the GPEP cohort, who present with different personal circumstances to those entering straight from school. This observation is in agreement with Tinto (1988) who explained individuals not entering university straight from school, for example those taking a gap-year, may face greater challenges (Tinto, 1988). International students can experience loneliness and struggle to achieve a sense of belonging, with Andersson et al. (2012) reporting a tendency in some cases to self-segregate. Those students resitting a year require closer monitoring. They have the potential to enter a vicious circle, accruing more debt during their resit year, which may necessitate undertaking paid work, potentially reducing study time. They will also be in a different year group, so no longer surrounded with their friends and peer support networks. Triventi (2014) reported students undertaking paid work may spend less time socialising as opposed to less time studying; this may further reduce the availability of peer support for these individuals. Intercalating students face similar problems. It is possible that some may be intercalating due to a reduced motivation to study dentistry, or unclear career goals. Kearns & Gardiner (2007) observed a clear sense of career purpose as being the most important time management behaviour for students, with such behaviour resulting in higher perceived work-related effectiveness and morale and less work-related distress.

A recommendation would be to consider allocating all such students, deemed to be at increased risk of progression difficulties, to experienced personal tutors who have received in-depth training as to how to support them. One tutor, for example, could have overall responsibility for GPEPs and one for International students.

8.2 Future work

8.2.1 Developing a model of progression and theoretical framework

During the course of the literature review it became apparent that no clear model of student progression exists. Much of the literature considered progression in terms of performance at high-stakes examinations, such as end-of-year assessments, often focussing on academic performance, rather than clinical competencies or clinical competence; and this was the reason for the broad definition of progression used in this thesis and a different epistemology in which knowledge and clinical practice were entwined. The literature also described progression in terms of transitions from one educational context to another with Crafter and Maunder (2012) describing the transition journey as being equally important as the outcome.

Future work should thus be undertaken to develop a model of progression, for a UK university entrant, through his/her dental education to the point of "safe beginner" at graduation (GDC, 2015b) and beyond to a final point of "expert". This model will include the period immediately post-graduation, encompassing the progression through Dental Foundation training and early career to specialist/consultant level. The model should be all-encompassing

and will afford an attempt to characterise stages in the development of clinical expertise, having a defined endpoint (specialist or consultant level), clear distinction between competence and competency, an explicit epistemological position utilising the notion of practice knowledge rather than decontextualised abstracted knowledge, as well as how student attributes/factors are related to developmental stages in a model of competence/competency.

8.2.2 Longitudinal data analysis

The ranking process could be refined further using additional data, for example that recorded on LiftUpp (Section 5.3.8.1). It would thus be possible to develop a ranking system that includes both clinical and academic information as well as establishing whether there is any correlation between the information collected on LiftUpp and students' academic performance in summative assessments. A carefully developed, comprehensive, objective ranking process would be of potential use during the DF1 interview process, enabling students' performance during their undergraduate programme to be taken into account.

Following refinement of the ranking process, it would be of value to investigate any correlation between the rankings and information available at the point of students' admission to KCLDI. Information such as A-level results, UKCAT and multiple mini-interview (MMI) scores are currently taken into account when considering whether to offer an individual a place to study dentistry at KCLDI. Identification of any correlation between admissions data,

including demographic information such as ethnicity, and the rankings, would enable the admissions process to be informed, with individuals most likely to progress satisfactorily selected. Identification of any such correlation would also enable identification of individuals that may require greater support as they progress through their programme. This work has already commenced, using UKCAT data, as described in Section 4.2.4. Similarly it would be of value to establish any correlation between undergraduate performance and performance post-qualification, for example in the MJDF examinations. Such information could then be used to inform the admissions process, as above.

8.2.3 Questionnaires

The questionnaire design could be further developed, to explore in greater depth specific areas of importance that emerged during this work. Social distractions, for example, were established to be one such area; questions could be incorporated within the questionnaire to further investigate the manner of these distractions.

It would be of interest to use the questionnaire in a longitudinal study, such that the same cohort completes an identical questionnaire in each of their years of study. It would then be possible to examine how factors such as PSS scores, hours of paid work undertaken and debt levels vary as students progress through their programme.

8.2.4 Focus groups and interviews

An attempt was made to interview students that had failed the first sitting of their BDS1 examinations, however ethical approval was not granted. It would be of value, if approval could be obtained, to conduct such interviews so that further insight could be gained into the reasons such individuals have struggled to progress.

Interviews with staff in the Education Directorate, who are involved with student welfare, would be of relevance. The student interviews conducted in this work, established the views only of those individuals prepared to participate, thus potentially introducing bias. Interviews with staff may reveal issues that have not emerged during the research. In addition, interviews with staff may help identify any emerging trends. For example, it is feasible that financial concerns may become more relevant with the recent increase in tuition fees.

9 Chapter 9. References

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10 Chapter 10. Appendices

10.1 Ethical approvals

10.1.1 Approval letter from gatekeeper of student data

Dental Institute
at Guy's, King's College
and St Thomas'
Hospitals

Education Directorate

Central Office
Floor 18, Tower Wing
Guy's Campus
London SE1 9RT
Telephone + 44 (0)20 7188 1162
Fax +44 (0)20 7188 1159

KING'S College LONDON

Mr Jonathan Turner,
PhD Student,
Floor 25, Guy's Tower Wing,
Great Maze Pond,
London Bridge.
SE1 9RT

12th June 2012

Dear Jonathan,

Many thanks for your letters of 2/5/2012 & 12/6/2012, I apologise profusely for the delay in replying to you.

I am delighted to give my permission for you to access data concerning cohorts of students at King's College London Dental Institute. This data will be covered by the requirements of the Ethics Committee and the Data Protection Act 1998; I am certain you will handle it appropriately.

I wish you success with your PhD studies and look forward to reading the results of your work.

Kindest regards,

Yours sincerely,

Mark Woolford
Professor of Education in Dentistry,
Director of Education, KCLDI

10.1.2 Letter granting ethical approval

Research Ethics Office

5.11 Franklin-Wilkins Building
(Waterloo Bridge Wing)
Stamford Street
London SE1 9NH
Tel 020 7848 4077/4070/4020
Email rec@kcl.ac.uk
www.kcl.ac.uk/research/ethics

KING'S College LONDON

Jonathan Turner
Department of Prosthodontics
Floor 25 Guy's Tower Wing
Guy's Hospital
London SE1 9RT

21 September 2012

Dear Jonathan

BDM/11/12-117 An assessment of the selection procedure and subsequent performance of King's College London dental students against externally defined parameters.

Review Outcome: Full Approval

Thank you for sending in the amendments/clarifications requested to the above project. I am pleased to inform you that these meet the requirements of the BDM RESC and therefore that full approval is now granted.

Please ensure that you follow all relevant guidance as laid out in the King's College London Guidelines on Good Practice in Academic Research (http://www.kcl.ac.uk/college/policyzone/index.php?id=247).

For your information ethical approval is granted until **21 September 2015**. If you need approval beyond this point you will need to apply for an extension to approval at least two weeks prior to this explaining why the extension is needed, (please note however that a full re-application will not be necessary unless the protocol has changed). You should also note that if your approval is for one year, you will not be sent a reminder when it is due to lapse.

Ethical approval is required to cover the duration of the research study, up to the conclusion of the research. The conclusion of the research is defined as the final date or event detailed in the study description section of your approved application form (usually the end of data collection when all work with human participants will have been completed), not the completion of data analysis or publication of the results. For projects that only involve the further analysis of pre-existing data, approval must cover any period during which the researcher will be accessing or evaluating individual sensitive and/or un-anonymised records. Note that after the point at which ethical approval for your study is no longer required due to the study being complete (as per the above definitions), you will still need to ensure all research data/records management and storage procedures agreed to as part of your application are adhered to and carried out accordingly.

If you do not start the project within three months of this letter please contact the Research Ethics Office.

Should you wish to make a modification to the project or request an extension to approval you will need approval for this and should follow the guidance relating to modifying approved applications: http://www.kcl.ac.uk/innovation/research/support/ethics/applications/modifications.aspx
The circumstances where modification requests are required include the addition/removal of participant groups, additions/removal/changes to research methods, asking for additional data from participants, extensions to the ethical approval period. Any proposed modifications should only be carried out once

full approval for the modification request has been granted.

Any unforeseen ethical problems arising during the course of the project should be reported to the approving committee/panel. In the event of an untoward event or an adverse reaction a full report must be made to the Chair of the approving committee/review panel within one week of the incident.

Please would you also note that we may, for the purposes of audit, contact you from time to time to ascertain the status of your research.

If you have any query about any aspect of this ethical approval, please contact your panel/committee administrator in the first instance (http://www.kcl.ac.uk/innovation/research/support/ethics/contact.aspx). We wish you every success with this work.

With best wishes

Yours sincerely

Catherine Fieulleteau
Senior Research Ethics Officer

Cc: Dr Lyndon Cabot
Professor David Bartlett

10.1.3 Letter granting approval for modifications

Research Ethics Office

5.11 Franklin Wilkins Building
(Waterloo Bridge Wing)
Stamford Street
London SE1 9NH
Tel 020 7848 4077/4070/3758
Email rec@kcl.ac.uk
www.kcl.ac.uk/research/ethics

KING'S College LONDON

Jonathan Turner
Prosthodontics
Floor 25 Guy's Tower Wing
Guy's Hospital
London SE1 9RT

25 October 2013

Dear Jonathan

BDM/11/12-117 An assessment of the progression of King's College London dental students and the determination of whether progression can inform the selection procedure.

Thank you for submitting a modification request for the above study. I am writing to confirm approval of this. The modifications are summarised below:

1. The title of the project has changed from 'An assessment of the selection procedure and subsequent performance of King's College London dental students against externally defined parameters' to 'An assessment of the progression of King's College London dental students and the determination of whether progression can inform the selection procedure'.
2. The researcher will undertake questionnaires and conduct focus groups and one to one interviews with this year's cohort of first and final year dental students.
3. Additional questions are included in the revised questionnaire.
4. The BDS1 interviews will be conducted between February 2014 and May 2014, at a time convenient to the students.
5. The staff interviews originally planned for this term will take place in Autumn 2014.
6. The original application stated that the researcher would undertake a document analysis of students entering on to the course between 2007 and 2012. Data will now be included from students entering the course in 2013.

If you have any questions regarding this application please contact the Research Ethics Office.

Yours sincerely

Catherine Fieulleteau
Senior Research Ethics Officer

10.2 Longitudinal data analysis

10.2.1 Additional figures

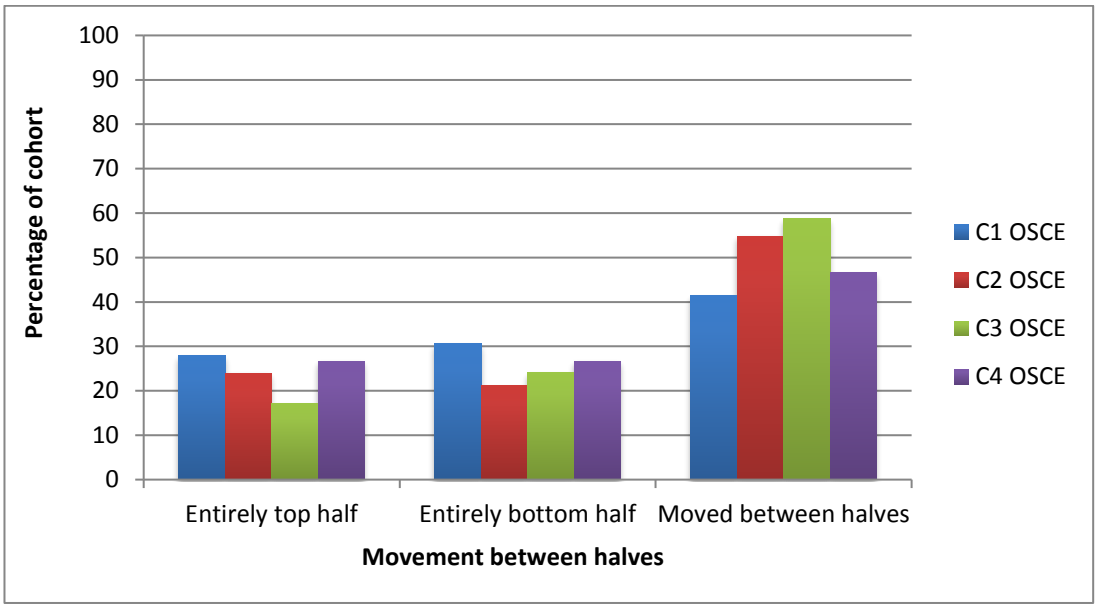


Figure 13. Proportion of students in C1, C2, C3 and C4 whose OSCE score in the BDS3, BDS4 and BDS5 end-of-year examination, remained in the top half of their year-group, bottom half or moved between halves, during progression from BDS3 to BDS5. C1, C2, C3 and C4 each undertook three OSCE examinations. C1 and C3 graduated in 2012 and C2 and C4 in 2013.

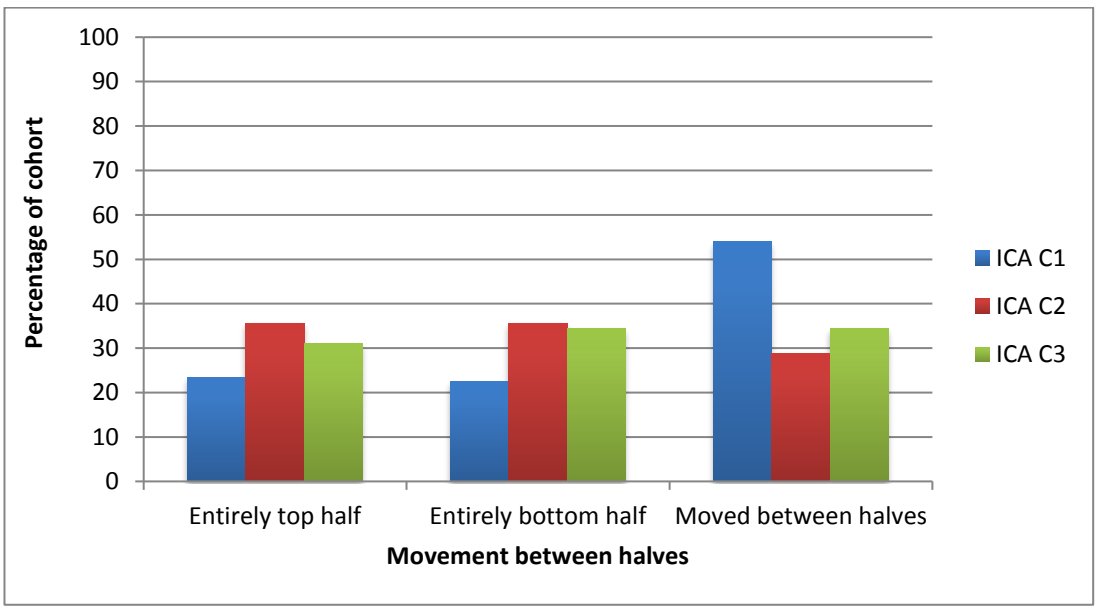


Figure 14. Proportion of students in C1, C2 and C3 whose in-course-assessment (ICA) score for each end-of-year examination, remained in the top half of their year-group, bottom half or moved between halves, during progression from BDS1 to BDS3 (C1) or BDS1 to BDS2 (C2 and C3). C1 undertook 3 ICA, C2 and C3 undertook 2 ICA. C1 and C3 graduated in 2012 and C2 in 2013.

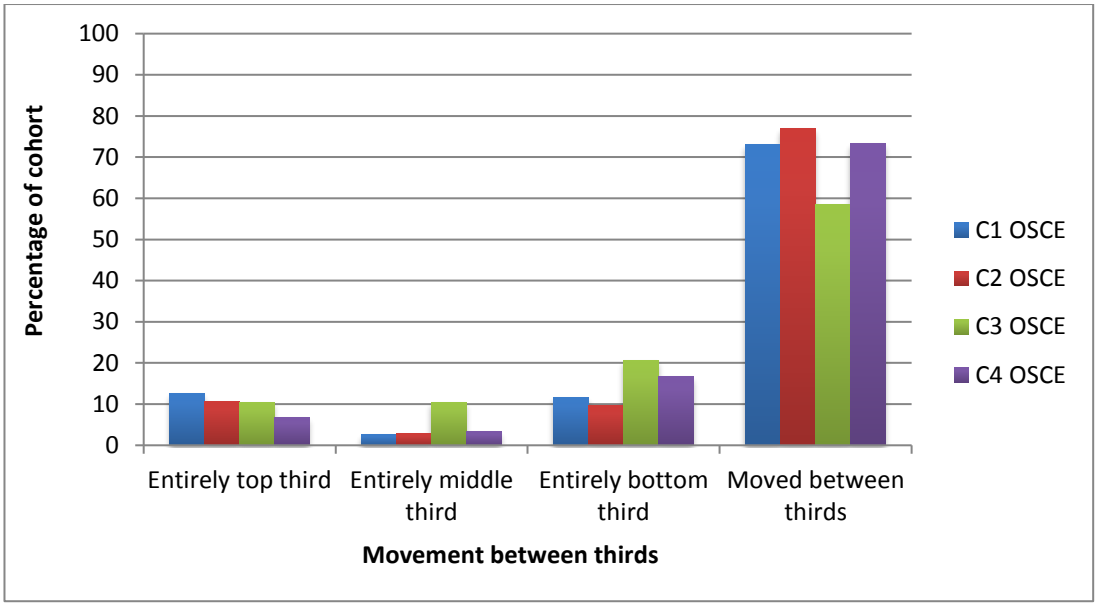


Figure 15. Proportion of students in C1, C2, C3 and C4 whose OSCE scores in the BDS3, BDS4 and BDS5 end-of-year examination, remained in the top third of their year-group, middle third, bottom third or moved between thirds, during progression from BDS3 to BDS5. C1, C2, C3 and C4 each undertook three OSCE examinations. C1 and C3 graduated in 2012 and C2 and C4 in 2013.

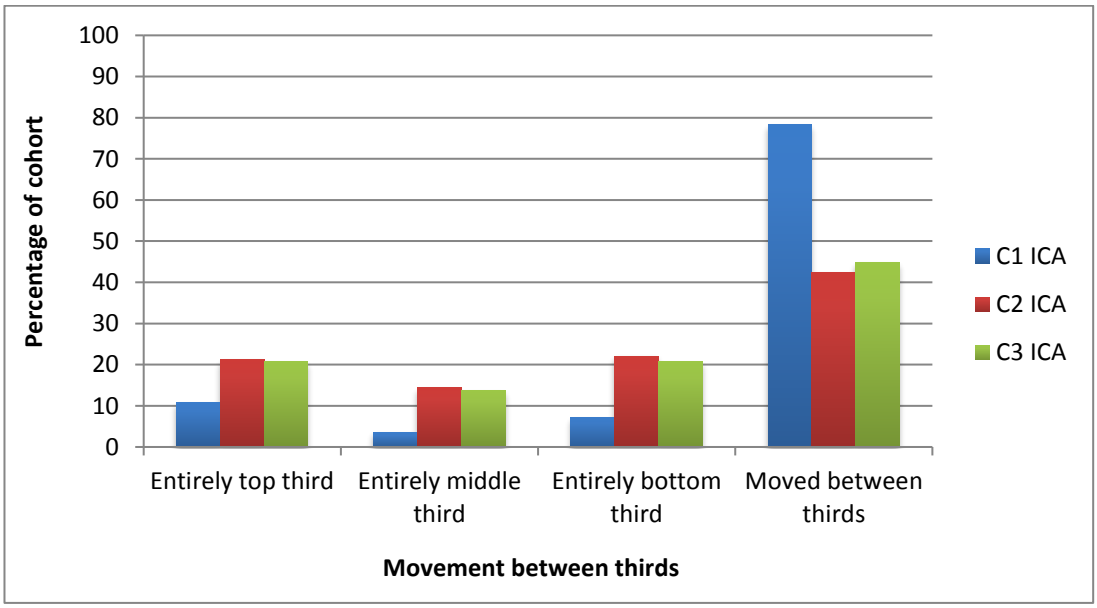


Figure 16. Proportion of students in C1, C2 and C3 whose in-course-assessment (ICA) score for each end-of-year examination, remained in the top third of their year-group, middle third, bottom third or moved between thirds, during progression from BDS1 to BDS3 (C1) or BDS1 to BDS2 (C2 and C3). C1 undertook 3 ICA, C2 and C3 undertook 2 ICA. C1 and C3 graduated in 2012 and C2 in 2013.

10.2.2 General linear (random effects) model

Table 62. Ethnicity of the students analysed. C1 and C2 were the 5-year pathways graduating in 2012 and 2013 respectively. C3 and C4 were the GPEP pathways graduating in 2012 and 2013 respectively. The percentage of the total number in each cohort is shown in brackets.

Ethnicity		Cohort			
		C1	C2	C3	C4
Non-white n (%)	Asian Bangladeshi			2 (6.9)	1 (3.3)
	Asian Chinese	4 (3.6)	5 (4.8)	1 (3.5)	1 (3.3)
	Asian Indian	56 (50.5)	51 (49.0)	3 (10.4)	3 (10.0)
	Asian Pakistani	8 (7.2)	8 (7.7)	1 (3.5)	4 (13.3)
	Asian Other	6 (5.4)	12 (11.5)	1 (3.5)	3 (10)
	Black African	2 (1.8)			
	Black Caribbean			1 (3.5)	1 (3.3)
	Black Other	1 (0.9)			1 (3.3)
	Mix White / Asian	1 (0.9)			
	Mix White / black Caribbean				1 (3.3)
	Other - Mixed	2 (1.8)	3 (2.9)	1 (3.5)	
	Other	5 (4.5)	5 (4.8)	2 (6.9)	
White n (%)	White - British	16 (14.4)	2 (1.9)		
	White	5 (4.5)	16 (15.4)	14 (48.3)	15 (50.0)
Not known n (%)		3 (2.7)			
Information refused / not given n (%)		2 (1.8)	2 (1.9)	3 (10.4)	

Table 63. Gender, ethnicity (categorised as white and non-white) and age, at graduation, of the students analysed. C1 and C3 were the 5-year and GPEP pathways, respectively, which graduated in 2012. C2 and C4 were the 5-year and GPEP pathways, respectively, which graduated in 2013.

		C1 & C3 combined	C2 & C4 combined
Gender	Female n (%)	80 (57.1)	82 (61.2)
	Male n (%)	60 (42.9)	52 (38.8)
Ethnicity	White n (%)	35 (25.0)	33 (24.6)
	Non-white n (%)	97 (69.3)	99 (73.9)
	Unknown n (%)	8 (5.7)	2 (1.5)
Age (at graduation)	Mean (SD)	24.9 (3.0)	24.6 (2.6)
	Median (min, max)	23.6 (22.7, 37.6)	23.7 (22.4, 43.2)

Table 64. Academic performance general linear (random effects) model for 5-year and GPEP programmes graduating in 2012 (C1 and C3). With in-course assessment excluded as a component part of BDS3 (calculation 2).

Predictor	Effect	p value	95% confidence intervals	
			LCL	UCL
Male gender	-0.29	0.52	-1.17	0.59
Non-white ethnicity	-1.84	0.001	-2.88	-0.79
Age	-0.06	0.51	-0.23	0.12

Table 65. Clinical performance general linear (random effects) model for 5-year and GPEP programmes graduating in 2012 (C1 and C3). With in-course assessment excluded as a component part of BDS3 (calculation 1).

Predictor	Effect	p value	95% confidence intervals	
			LCL	UCL
Male gender	-0.22	0.76	-1.64	1.20
Non-white ethnicity	-1.46	0.09	-3.13	0.21
Age	-0.14	0.32	-0.41	0.13

Table 66. Clinical performance general linear (random effects) model for 5-year and GPEP programmes graduating in 2012 (C1 and C3). With in-course assessment included as a component part of BDS3 (calculation 1).

Predictor	Effect	p value	95% confidence intervals	
			LCL	UCL
Male gender	-0.08	0.91	-1.46	1.31
Non-white ethnicity	-1.52	0.07	-3.15	0.11
Age	-0.08	0.54	-0.35	0.18

10.3 Questionnaire

10.3.1 Information sheet for Questionnaire 1.

QUESTIONNAIRE

INFORMATION SHEET FOR PARTICIPANTS

REC Reference Number: BDM/11/12-117

YOU WILL BE GIVEN A COPY OF THIS INFORMATION SHEET

An assessment of the selection procedure and subsequent performance of King's College London dental students

We would like to invite you to participate in this original postgraduate research project. You should only participate if you want to; choosing not to take part will not disadvantage you in any way. Before you decide whether you want to take part, it is important for you to understand why the research is being done and what your participation will involve. Please take time to read the following information carefully and discuss it with others if you wish. Ask us if there is anything that is not clear or if you would like more information.

The aim of the research is to determine the effectiveness of King's College London Dental School's admissions process at selecting individuals who will develop and progress to become high performing students and dentists. This study should also provide a picture of how the school's graduates perform at a national level and are viewed by those in charge of vocational training. As part of this research we would like to hear the views of our undergraduate students concerning various related topics.

Though you may not personally benefit from participating in this research, there is a possibility that it may lead to recommendations being made regarding King's undergraduate admissions system, the educational experience of students or the national vocational training selection process. I do not envisage there to be any risks associated with taking part and you will be able to have a copy of the final report upon request.

We are recruiting students from the BDS1 and BDS5 years to participate in a questionnaire. All students in BDS1 and BDS5 are eligible to apply, with the exception of those on the Dentistry Entry Programme For Medical Graduates (DPMG's) due to the small number of these latter individuals.

The questionnaires will be distributed to all eligible students at the end of a lecture or tutorial and will take approximately 5 to 10 minutes to complete. The questionnaire will ask your opinion on areas that could potentially affect progression through the course, such as accommodation issues and levels of debt. For those that have failed BDS examinations your views on potential contributory factors will be sought.

The questionnaire will have a unique identifier on them which will be linked to your student number, to enable the principal investigator (Dr Jonathan Turner, a Senior Clinical Teacher in the Department of Prosthodontics) to analyse the results. Your data may also be analysed by the research team, however no one other than Jonathan Turner will have knowledge of who completed the forms. Once

the results have been processed all data will be completely anonymised prior to publication and confidentiality maintained.

It is up to you to decide whether to take part or not but whether or not you decide to take part will have no affect on your academic progress. If you decide to take part you are still free to withdraw at any time and without giving a reason. In addition to withdrawing yourself from the study, you may also withdraw any data/information you have already provided up until 1 March 2013. If you do decide to take part, you will be given this information sheet to keep and be asked to give consent to your participation on the questionnaire.

If you would like any further details about this study please contact:

Jonathan Turner (Principal Investigator), Department of Prosthodontics, Floor 25, Guy's Tower Wing,

Telephone: 0207 188 7477, e-mail: jonathan.turner@kcl.ac.uk

If you decide to take part in the research, you will be covered by King's College London's No Fault Compensation insurance. If this study has harmed you in any way you can contact King's College London using the details below for further advice and information:

Dr L. Cabot, Department of Prosthodontics, Floor 25, Guy's Tower Wing. e-mail: cab.cabot@kcl.ac.uk

10.3.2 Questionnaire 1

QUESTIONNAIRE FOR BDS1 AND BDS5 STUDENTS

Consent

I consent to the processing of my personal information for the purposes of this research study. I understand that such information will be treated as strictly confidential and handled in accordance with the provisions of the Data Protection Act 1998.

(Please tick box to indicate consent) ☐

Section 1: General

Please circle the appropriate answers to the following questions:

What is your Gender?

Male Female

What is your Age?

under 18 18 19

20-24 25-29 30-34 35 or older

What is your Year / Course?

BDS1 BDS5 (GPEP) BDS5 (5 year course)

Do you have a degree already?

Yes No

Section 2: Accommodation

Which one of the following best describes the type of accommodation that you have lived in mainly during the previous 6 months? Please circle the appropriate answer:

Parental home Own Home Student flat/house share

University Hall of Residence Other (please specify below)

……..……

To what extent, if at all, do you feel the following factors, related to your accommodation, hinder your ability to study effectively?

Using the scale of 0 to 4 circle one of the options, with 0 being "no hindrance at all" and 4 being "significant hindrance to my studies" or n/a if the factor does not apply to you.

Difficulties involved with the journey to University

0 1 2 3 4 n/a

Family responsibilities (e.g. caring role for relative)

0 1 2 3 4 n/a

Lack of resources (e.g. computer / internet access)

0 1 2 3 4 n/a

Lack of space to work (e.g. desk)

0 1 2 3 4 n/a

Noise

0 1 2 3 4 n/a

Social distractions

0 1 2 3 4 n/a

Please state any additional factors, related to your accommodation, that hinder your ability to study effectively

……

Section 3: Finance

Please circle the appropriate answers to the following questions:

What is your current level of debt (including tuition fees and student loans)?

No debt Less than £1,000 £1,000-£9,999

£10,000-£19,999 £20,000-29,999 £30,000-£39,999

Over £40,000 (please specify how much).....

What is your current level of debt (excluding tuition fees but including student loans)?

No debt Less than £1,000 £1,000-£9,999

£10,000-£19,999 £20,000-29,999 £30,000-£39,999

Over £40,000 (please specify how much).....

To what extent do you feel that worrying about this debt is affecting your studies? Using the scale of 0 to 4, circle one of the following options, with 0 being “not at all” and 4 being “significant affect on my studies” or n/a if you have no debt.

0 1 2 3 4 n/a

Which one of the following best describes the number of hours you have spent each week in paid employment (on average during the past 6 months):

Nil 1 to 5 6 to 10 11 or more

To what extent do you feel this time spent in paid employment affects your studies?

Using the scale of 0 to 4 circle one of the following options, with 0 being “not at all” and 4 being “considerably” or n/a if you have not been employed during the past 6 months.

0 1 2 3 4 n/a

Section 4: Teaching

The following are different teaching methods; please rate each one.

Circle one of the options, with 0 being “I find this method of teaching of no benefit to me at all” and 4 being “I find this method extremely useful” or n/a if you have not experienced a particular method.

Lectures

0 1 2 3 4 n/a

Tutorials

0 1 2 3 4 n/a

Chair-side teaching

0 1 2 3 4 n/a

Online learning

0 1 2 3 4 n/a

Other methods you have experienced (please specify and rate below)

……

Section 5: Perceived Stress Scale

The following questions are a commonly used, validated tool, to determine perceived levels of stress. Please circle one of the options following each question using the following scale:

0: never, 1: almost never, 2: sometimes, 3: fairly often, 4: very often

In the last month, how often have you been upset because of something that happened unexpectedly?

0 1 2 3 4

In the last month, how often have you felt that you were unable to control the important things in your life?

0 1 2 3 4

In the last month, how often have you felt nervous and “stressed”?

0 1 2 3 4

<u>Scale:</u> **0: never, 1: almost never, 2: sometimes, 3: fairly often, 4: very often**

In the last month, how often have you felt confident about your ability to handle your personal problems?

0 1 2 3 4

In the last month, how often have you felt that things were going your way?

0 1 2 3 4

In the last month, how often have you found that you could not cope with all the things that you had to do?

0 1 2 3 4

In the last month, how often have you been able to control irritations in your life?

0 1 2 3 4

In the last month, how often have you felt that you were on top of things?

0 1 2 3 4

In the last month, how often have you been angered because of things that happened that were outside of your control?

0 1 2 3 4

In the last month, how often have you felt difficulties were piling up so high that you could not overcome them?

0 1 2 3 4

- If you are a **BDS1** student **<u>that has already got a degree</u>** please proceed to **Section 8**
- All other **BDS1** students please continue to **Section 6**
- If you are a **BDS5** student please now proceed to **Section 7**

Section 6: Transition to University. (Only for BDS1 students with no degree)

Did you undertake a gap year? Yes No

If you did undertake a gap year, do you feel this has had any influence on your progression through BDS1 at all? Yes No

If the gap year has influenced your progression, please explain how it has:

.....

Please rate how easy you have found the transition from the school-learning environment to that at University, in relation to the following aspects.

(Circle one of the options, with 0 being “caused me no difficulties” and 4 being “caused me great difficulties” or n/a if the option is not relevant to you)

Change in teaching style from school to university

0 1 2 3 4 n/a

Change in complexity / difficulty of work between school and university

0 1 2 3 4 n/a

Difference in volume of work between school and university

0 1 2 3 4 n/a

Please add any further thoughts that you may have concerning your transition from school to University:.....

.....

If you have moved away from your parental home, how easy have you found it to adapt to this change in environment?

(Circle one of the options, with 0 being “caused no difficulties” and 4 being “very difficult” or n/a if you have not moved away)

0 1 2 3 4 n/a

- **BDS1** students please proceed to **Section 8**

Section 7: BDS Examinations (To be completed by BDS5 Students only)

Have you had to re-sit any of the following end-of-year examinations?

(Circle all that apply)

BDS1 BDS2 BDS3 BDS4 None

If you have NOT needed to resit, please proceed to **Section 8**.

If you have had to resit one or more of these exams, please consider the 8 possible contributory causes listed below.

On a scale of 0 to 4 please rate each of these, with 0 indicating a cause that had no relevance to you failing an exam and 4 indicating a cause that you felt was a greatly contributing factor.

Please also indicate, for any relevant causes, the BDS exam that was affected

Affected Exam ↓

Accommodation issues

0 1 2 3 4 ……..

Family problems

0 1 2 3 4 ……..

Financial issues

0 1 2 3 4 ……..

Health problems

0 1 2 3 4 ……..

Learning / teaching issues

0 1 2 3 4 ……..

Relationship problems

0 1 2 3 4 ……..

Social Life

0 1 2 3 4 ……..

Lack of study (unrelated to the above reasons)

0 1 2 3 4 ……..

Other (please specify)……

……...

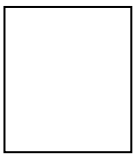
Section 8: Future Work

I am planning to carry out some focus group discussions and some interviews to study the above and related areas in more detail.

These sessions will each be of approximately 1 hour in duration.

If you are happy to be contacted, with a view to possibly participating in one or both of these areas of work, please tick the box below.

(You are under no obligation to participate even if you do tick the box – participation is entirely voluntary)



Thank you for taking the time to complete this questionnaire.

10.3.3 Additional results for Questionnaire 1

Table 67. Factors related to students' accommodation with the corresponding mean (SD) and median (min, max) scores and p values for females and males. A score of 0 = no hindrance to studies, 4 = a significant hindrance to studies. (Mann-Whitney test).

	Female		Male		p value
	Mean (SD)	Median (min, max)	Mean (SD)	Median (min, max)	
Difficulty with journey	1.53 (1.40)	1.50 (0, 4)	1.34 (1.30)	1.00 (0, 4)	0.36
Family responsibilities	1.11 (1.36)	0.50 (0, 4)	0.96 (1.29)	0.00 (0, 4)	0.38
Lack of resources	0.65 (1.14)	0.00 (0, 4)	0.61 (1.04)	0.00 (0, 4)	0.92
Lack of space to work	1.02 (1.38)	0.00 (0, 4)	1.04 (1.21)	1.00 (0, 4)	0.47
Noise	1.62 (1.37)	1.00 (0, 4)	1.65 (1.29)	2.00 (0, 4)	0.80
Social distractions	2.19 (1.30)	2.00 (0, 4)	2.49 (1.25)	3.00 (0, 4)	0.09

Table 68. Factors related to students' accommodation with the corresponding mean (SD) and median (min, max) scores and p values for the different age bands. A score of 0 = no hindrance to studies, 4 = a significant hindrance to studies. (Kruskal-Wallis test).

	Under 20		20 to 24		25 or over		p value
	Mean (SD)	Median (min, max)	Mean (SD)	Median (min, max)	Mean (SD)	Median (min, max)	
Difficulty with journey	1.11 (1.30)	0.00 (0, 4)	1.57 (1.37)	1.00 (0, 4)	1.81 (1.33)	2.00 (0, 4)	0.01
Family responsibilities	0.84 (1.20)	0.00 (0, 4)	1.11 (1.33)	1.00 (0, 4)	1.33 (1.59)	0.00 (0, 4)	0.29
Lack of resources	0.54 (0.96)	0.00 (0, 3)	0.67 (1.20)	0.00 (0, 4)	0.71 (1.01)	0.00 (0, 3)	0.65
Lack of space to work	0.79 (1.11)	0.00 (0, 4)	1.05 (1.35)	0.00 (0, 4)	1.53 (1.48)	1.50 (0, 4)	0.06
Noise	1.64 (1.24)	2.00 (0, 4)	1.60 (1.39)	1.00 (0, 4)	1.74 (1.37)	2.00 (0, 4)	0.82
Social distractions	2.27 (1.41)	3.00 (0, 4)	2.33 (1.22)	2.00 (0, 4)	2.37 (1.27)	3.00 (0, 4)	0.97

Table 69. Different debt bands and number and proportion of female and male students within each band, both including and excluding tuition fees. (Chi-squared test, p = 0.89 for comparison between gender including tuition fees and p = 0.88 excluding tuition fees). The figures in brackets represent the percentage of the total, for each gender, that answered the question.

	Female		Male	
Debt	With tuition fees n (%)	Excluding tuition fees n (%)	With tuition fees n (%)	Excluding tuition fees n (%)
0	22 (16.4)	38 (29.2)	18 (19.6)	26 (29.2)
<£10,000	20 (14.9)	42 (32.3)	15 (16.3)	33 (37.1)
£10,000 to £19,999	41 (30.6)	18 (13.9)	25 (27.2)	11 (12.4)
£20,000 and over	51 (38.1)	32 (24.6)	34 (37.0)	19 (21.4)
Total	134 (100.0)	130 (100.0)	92 (100.0)	89 (100.0)

Table 70. Different debt bands and number and proportion of students within each band (age under 20, 20 to 24 and 25 or over) both including and excluding tuition fees. (Chi-squared test, p < 0.001 for comparison between age bands, both including and excluding tuition fees). The figures in brackets represent the percentage of the total, in each age-band, that answered the question.

	Under 20		20 to 24		25 or over	
Debt	With tuition fees n (%)	Excluding tuition fees n (%)	With tuition fees n (%)	Excluding tuition fees n (%)	With tuition fees n (%)	Excluding tuition fees n (%)
0	16 (21.3)	34 (46.6)	19 (15.8)	23 (19.8)	5 (16.1)	7 (23.3)
<£10,000	23 (30.7)	38 (52.0)	8 (6.6)	30 (25.8)	4 (12.9)	7 (23.3)
£10,000 to £19,999	36 (48.0)	1 (1.4)	21 (17.5)	21 (18.1)	9 (29.0)	7 (23.3)
£20,000 and over	-	-	72 (60.0)	42 (36.2)	13 (41.9)	9 (30.1)
Total	75 (100.0)	73 (100.0)	120 (100.0)	116 (100.0)	31 (100.0)	30 (100.0)

Table 71. Number and proportion of female and male students with no paid employment, 1-5 hours of employment, 6-10 hours or 11 or more hours, per week. (Chi-squared test, p = 0.97). The figures in brackets represent the percentage of the total, for each gender, that answered the question.

Hours worked (per week)	Female n (%)	Male n (%)	Total n (%)
0	107 (78.7)	73 (81.1)	180 (79.6)
1-5	15 (11.0)	8 (8.9)	23 (10.2)
6-10	8 (5.9)	5 (5.6)	13 (5.8)
11 or more	6 (4.4)	4 (4.4)	10 (4.4)
Total	136 (100.0)	90 (100.0)	226 (100.0)

Table 72. Number and proportion of students with no paid employment, 1-5 hours of employment, 6-10 hours or 11 or more hours, per week, by age band. (Chi-squared test, p = 0.24). The figures in brackets represent the percentage of the total, in each age-band, that answered the question.

Hours worked (per week)	Age			Total n (%)
	<20 n (%)	20-24 n (%)	>24 n (%)	
0	61 (82.4)	99 (81.8)	20 (64.5)	180 (79.6)
1-5	7 (9.5)	10 (8.3)	6 (19.4)	23 (10.2)
6-10	5 (6.8)	5 (4.1)	3 (9.7)	13 (5.8)
11 or more	1 (1.4)	7 (5.8)	2 (6.5)	10 (4.4)
Total	74 (100.0)	121 (100.0)	31 (100.0)	226 (100.0)

Table 73. Students' worry about debt and the effect of paid work on their studies, with corresponding mean (SD) and median (min, max) scores and p values by age band. A score of 0 = no effect on studies, 4 = significant / considerable effect on studies. (Kruskal-Wallis test). The percentage figures in brackets represent the proportion of students who answered the question, relative to the total number of completed questionnaires (all age-bands combined).

	Under 20		20 to 24		25 or over		Resp n (%)	p value
	Mean (SD)	Median (min, max)	Mean (SD)	Median (min, max)	Mean (SD)	Median (min, max)		
Worry about debt	0.68 (1.04)	0.00 (0, 4)	1.37 (1.33)	1.00 (0, 4)	1.78 (1.53)	2.00 (0, 4)	210 (92.1)	<0.001
Effect of paid work on studies	1.38 (1.19)	1.00 (0, 3)	2.35 (1.07)	2.00 (0, 4)	2.55 (1.44)	3.00 (0, 4)	47 (20.6)	0.04

Table 74. Different teaching methods, with corresponding mean (SD) and median (min, max) scores and p values for females and males. A score of 0 = no benefit, 4 = extremely useful. (Mann-Whitney test).

	Female		Male		p value
	Mean (SD)	Median (min, max)	Mean (SD)	Median (min, max)	
Lectures	2.37 (0.96)	2.00 (0, 4)	2.09 (1.05)	2.00 (0, 4)	0.08
Tutorials	3.37 (0.76)	4.00 (1, 4)	3.36 (0.70)	3.00 (1, 4)	0.75
Chairside	3.69 (0.58)	4.00 (1, 4)	3.69 (0.58)	4.00 (1, 4)	0.92
Online	2.19 (1.17)	2.00 (0, 4)	2.20 (1.04)	2.00 (0, 4)	0.94

Table 75. Different teaching methods, with corresponding mean (SD) and median (min, max) scores and p values, by age band. A score of 0 = no benefit, 4 = extremely useful. (Kruskal-Wallis test).

	Under 20		20 to 24		25 or over		p value
	Mean (SD)	Median (min, max)	Mean (SD)	Median (min, max)	Mean (SD)	Median (min, max)	
Lectures	2.20 (0.75)	2.00 (0, 4)	2.22 (1.13)	2.00 (0, 4)	2.50 (1.01)	3.00 (0, 4)	0.26
Tutorials	3.45 (0.68)	4.00 (2, 4)	3.33 (0.76)	3.00 (1, 4)	3.29 (0.78)	3.00 (1, 4)	0.45
Chairside	3.55 (0.69)	4.00 (1, 4)	3.76 (0.50)	4.00 (2, 4)	3.74 (0.58)	4.00 (2, 4)	0.052
Online	2.58 (0.95)	3.00 (0, 4)	2.03 (1.14)	2.00 (0, 4)	2.07 (1.17)	2.00 (0, 4)	0.01

Table 76. Transition from school to university. Difficulties perceived by students in changes to teaching style, work complexity, work volume and moving away from home, with corresponding mean (SD) and median (min, max) scores and p values, by gender. A score of 0 = caused no difficulties, 4 = very difficult. (Mann-Whitney test). The percentage figures in brackets represent the proportion of students who answered the question (male and females combined), relative to the total number of completed questionnaires.

	Female		Male		Respondents n (%)	p value
	Mean (SD)	Median (min, max)	Mean (SD)	Median (min, max)		
Change in teaching style	2.82 (0.81)	3.00 (1, 4)	2.63 (0.90)	3.00 (0, 4)	89 (83.2)	0.41
Change in complexity/difficulty of work	2.70 (0.93)	3.00 (1, 4)	2.45 (1.04)	2.50 (0, 4)	90 (84.1)	0.27
Difference in volume of work	3.06 (0.82)	3.00 (1, 4)	3.25 (0.78)	3.00 (1, 4)	90 (84.1)	0.26
Ease of adapting to move away from parental home	1.87 (1.14)	2.00 (0, 4)	1.52 (1.33)	1.00 (0, 4)	55 (51.4)	0.27

Table 77. Logistic regression analysis of students who undertook a resit of their end of year BDS examination. Male students and those with a degree were the predictor variables.

	OR	p value	95% confidence intervals	
			LCL	UCL
Male	2.27	0.08	0.91	5.67
Have degree	0.73	0.67	0.17	3.17

10.3.4 Additional questions used in BDS1 Questionnaire 2

Section 1: General

Are you an International Student?

Yes No

If you **do** have a degree please answer the following questions:

In which subject was your first degree?

…….....

To what extent, if at all, do you feel having this degree has helped with your understanding of the BDS1 course material in Term 1?

Using the scale of 0 to 4 circle one of the options, with 0 being “no help with understanding at all” and 4 being “significant help with my understanding”

0 1 2 3 4

Could you please comment on why you feel that your degree has helped or not helped with your progression

.....

Section 2: Accommodation

Approximately how long does it take you to travel from your accommodation to university (one-way). Please circle the appropriate answer below:

Under 10 mins 10-30 mins 31-60 mins Over 60 mins

Section 4: Teaching

The following are different teaching methods; please rate each one.
Circle one of the options, with 0 being “I find this method of teaching of no benefit to me at all” and 4 being “I find this method extremely useful” or n/a if you have not experienced a particular method.

Workshops

0 1 2 3 4 n/a

10.3.5 Additional questions used in BDS5 Questionnaire 2

Section 1: General

Are you an International Student?

Yes No

What was your DF1 ranking? (Please do not feel under any obligation to provide this information if you would rather not)

……..

Do you have a degree already?

Yes No

If you **do** have a degree please answer the following questions:

Was it an intercalated degree? (Please circle the appropriate answer below)

Yes No

In which subject was your FIRST degree?

……

To what extent, if at all, do you feel having this degree has helped with your progression through the BDS programme?

Using the scale of 0 to 4 circle one of the options, with 0 being “no help with progression at all” and 4 being “significant help with my progression”

0 1 2 3 4

Could you please comment on why you feel that your degree has helped, or not helped, with your progression

.....

.....

Section 2: Accommodation

Approximately how long does it take you to travel from your accommodation to university (one-way). Please circle the appropriate answer below:

Under 10 mins 10-30 mins 31-60 mins Over 60 mins

Section 4: Teaching

The following are different teaching methods; please rate each one.

Circle one of the options, with 0 being “I find this method of teaching of no benefit to me at all” and 4 being “I find this method extremely useful” or n/a if you have not experienced a particular method.

Workshops

0 1 2 3 4 n/a

10.3.6 Questionnaire 2 additional results

Table 78. Factors related to students' accommodation, with the corresponding mean (SD) and median (min, max) scores and p values for BDS1 and BDS5. A score of 0 = no hindrance to studies, 4 = a significant hindrance to studies. (Mann-Whitney test).

	BDS1		BDS5		p value
	Mean (SD)	Median (min, max)	Mean (SD)	Median (min, max)	
Difficulty with journey	1.27 (1.36)	1.00 (0,4)	1.44 (1.32)	1.00 (0,4)	0.25
Family responsibilities	0.66 (1.00)	0.00 (0,4)	0.99 (1.24)	0.00 (0,4)	0.045
Lack of resources	0.76 (1.04)	0.00 (0,4)	0.32 (0.78)	0.00 (0,4)	<0.001
Lack of space to work	0.98 (1.15)	1.00 (0,4)	0.74 (1.11)	0.00 (0,4)	0.046
Noise	1.64 (1.21)	2.00 (0,4)	1.36 (1.25)	1.00 (0,4)	0.048
Social distractions	1.99 (1.31)	2.00 (0,4)	2.16 (1.23)	2.00 (0,4)	0.25

Table 79. Factors related to students' accommodation, with the corresponding mean (SD) and median (min, max) scores and p values for females and males. A score of 0 = no hindrance to studies, 4 = a significant hindrance to studies. (Mann-Whitney test).

	Female		Male		p value
	Mean (SD)	Median (min, max)	Mean (SD)	Median (min, max)	
Difficulty with journey	1.47 (1.37)	1.00 (0, 4)	1.22 (1.26)	1.00 (0, 4)	0.18
Family responsibilities	0.77 (1.12)	0.00 (0, 4)	0.97 (1.20)	0.00 (0, 4)	0.18
Lack of resources	0.49 (0.93)	0.00 (0, 4)	0.55 (0.93)	0.00 (0, 4)	0.43
Lack of space to work	0.78 (1.12)	0.00 (0, 4)	0.95 (1.14)	1.00 (0, 4)	0.15
Noise	1.48 (1.23)	1.00 (0, 4)	1.48 (1.26)	1.00 (0, 4)	0.90
Social distractions	1.97 (1.27)	2.00 (0, 4)	2.26 (1.24)	2.00 (0, 4)	0.09

Table 80. Factors related to students' accommodation, with the corresponding mean (SD) and median (min, max) scores and p values for the different age bands. A score of 0 = no hindrance to studies, 4 = a significant hindrance to studies. (Kruskal-Wallis test).

	Under 20		20 to 24		25 or over		p value
	Mean (SD)	Median (min, max)	Mean (SD)	Median (min, max)	Mean (SD)	Median (min, max)	
Difficulty with journey	1.24 (1.38)	1.00 (0, 4)	1.37 (1.29)	1.00 (0, 4)	1.69 (1.39)	1.00 (0, 4)	0.20
Family responsibilities	0.51 (0.83)	0.00 (0, 3)	0.90 (1.16)	0.00 (0, 4)	1.41 (1.52)	1.00 (0, 4)	0.006
Lack of resources	0.78 (1.10)	0.00 (0, 4)	0.40 (0.79)	0.00 (0, 4)	0.38 (0.94)	0.00 (0, 4)	0.008
Lack of space to work	0.87 (1.11)	0.00 (0, 4)	0.83 (1.11)	0.00 (0, 4)	0.84 (1.29)	0.00 (0, 4)	0.85
Noise	1.58 (1.24)	2.00 (0, 4)	1.52 (1.23)	1.00 (0, 4)	1.09 (1.23)	1.00 (0, 4)	0.12
Social distractions	2.10 (1.32)	2.00 (0, 4)	2.14 (1.20)	2.00 (0, 4)	1.78 (1.43)	2.00 (0, 4)	0.35

Table 81. BDS1 students' journey time to university (one-way), by age. (Chi-squared test, p = 0.18. The 20-24 and >24 categories were combined to form a ≥20 band). The figures in brackets represent the percentage of the total, for each age-band, that answered the question.

	Age		
	<20 n (%)	20-24 n (%)	>24 n (%)
<10 minutes	26 (32.9)	7 (24.1)	0 (0.0)
10-30 minutes	29 (36.7)	9 (31.0)	0 (0.0)
31 – 60 minutes	15 (19.0)	8 (27.6)	4 (100.0)
Over 60 minutes	9 (11.4)	5 (17.2)	0 (0.0)
Total	79 (100.0)	29 (100.0)	4 (100.0)

Table 82. Different debt bands and number and proportion of BDS1 and BDS5 students within each band, both including and excluding tuition fees. (Chi-squared test, p < 0.001 for comparison between year groups, both including and excluding tuition fees). The figures in brackets represent the percentage of the total, in each year group, that answered the question.

	BDS1		BDS5	
Debt	With tuition fees n (%)	Excluding tuition fees n (%)	With tuition fees n (%)	Excluding tuition fees n (%)
0	17 (15.3)	41 (36.6)	26 (17.7)	37 (25.5)
<£10,000	36 (32.4)	64 (57.1)	8 (5.4)	16 (11.0)
£10,000 to £19,999	47 (42.3)	7 (6.3)	15 (10.2)	20 (13.8)
£20,000 and over	11 (9.9)	0 (0.0)	98 (66.7)	72 (49.7)
Total	111 (100.0)	112 (100.0)	147 (100.0)	145 (100.0)

Table 83. Different debt bands and number and proportion of female and male students within each band, both including and excluding tuition fees. (Chi-squared test, p = 0.61 for comparison between gender including tuition fees and p = 0.03 excluding tuition fees). The figures in brackets represent the percentage of the total, for each gender, that answered the question.

	Female		Male	
Debt	With tuition fees n (%)	Excluding tuition fees n (%)	With tuition fees n (%)	Excluding tuition fees n (%)
0	28 (17.5)	48 (29.8)	15 (15.3)	30 (31.3)
<£10,000	28 (17.5)	43 (26.7)	16 (16.3)	37 (38.5)
£10,000 to £19,999	34 (21.3)	23 (14.3)	28 (28.6)	4 (4.2)
£20,000 and over	70 (43.8)	47 (29.2)	39 (39.8)	25 (26.0)
Total	160 (100.1)	161 (100.0)	98 (100.0)	96 (100.0)

Table 84. Different debt bands and number and proportion of students within each band (age under 20, 20 to 24 and 25 or over) both including and excluding tuition fees. (Chi-squared test, p < 0.001 for comparison between age bands, both including and excluding tuition fees). The figures in brackets represent the percentage of the total, for each age-band, that answered the question.

	Under 20		20 to 24		25 or over	
Debt	With tuition fees n (%)	Excluding tuition fees n (%)	With tuition fees n (%)	Excluding tuition fees n (%)	With tuition fees n (%)	Excluding tuition fees n (%)
0	10 (12.8)	29 (36.7)	24 (16.6)	36 (24.7)	9 (25.7)	13 (40.6)
<£10,000	30 (38.5)	50 (63.3)	13 (9.0)	26 (17.8)	1 (2.9)	4 (12.5)
£10,000 to £19,999	36 (46.2)	0 (0.0)	22 (15.2)	26 (17.8)	4 (11.4)	1 (3.1)
£20,000 and over	2 (2.6)	0 (0.0)	86 (59.3)	58 (39.7)	21 (60.0)	14 (43.8)
Total	78 (100.0)	79 (100.0)	145 (100.0)	146 (100.0)	35 (100.0)	32 (100.0)

Table 85. Number and proportion of BDS1 and BDS5 students with no paid employment, 1-5 hours of employment, 6-10 hours or 11 or more hours, per week. (Chi-squared test, p = 0.81). The figures in brackets represent the percentage of the total, in each year group, that answered the question.

Hours worked (per week)	BDS1 n (%)	BDS5 n (%)	Total n (%)
0	87 (77.0)	116 (77.3)	203 (77.2)
1-5	13 (11.5)	18 (12.0)	31 (11.8)
6-10	5 (4.4)	9 (6.0)	14 (5.3)
11 or more	8 (7.1)	7 (4.7)	15 (5.7)
Total	113 (100.0)	150 (100.0)	263 (100.0)

Table 86. Number and proportion of female and male students with no paid employment, 1-5 hours of employment, 6-10 hours or 11 or more hours, per week. (Chi-squared test, p = 0.08). The figures in brackets represent the percentage of the total, for each gender, that answered the question.

Hours worked (per week)	Female n (%)	Male n (%)	Total n (%)
0	133 (81.6)	70 (70.0)	203 (77.2)
1-5	13 (8.0)	18 (18.0)	31 (11.8)
6-10	9 (5.5)	5 (5.0)	14 (5.3)
11 or more	8 (4.9)	7 (7.0)	15 (5.7)
Total	163 (100.0)	100 (100.0)	263 (100.0)

Table 87. Students' worry about debt and the effect of paid work on their studies, with corresponding mean (SD) and median (min, max) scores and p values, for BDS1 and BDS5. A score of 0 = no effect on studies, 4 = significant / considerable effect on studies. (Mann-Whitney test). The percentage figures in brackets represent the proportion of students who answered the question, relative to the total number of completed questionnaires (BDS1 and BDS5 combined).

	BDS1		BDS5		Responses n (%)	p value
	Mean (SD)	Median (min, max)	Mean (SD)	Median (min, max)		
Worry about debt	0.95 (1.18)	1.00 (0, 4)	1.12 (1.23)	1.00 (0, 4)	243 (91.7)	0.25
Effect of paid work on studies	1.58 (1.27)	1.00 (0, 4)	2.00 (1.28)	2.00 (0, 4)	59 (22.3)	0.21

Table 88. Students' worry about debt and the effect of paid work on their studies, with corresponding mean (SD) and median (min, max) scores and p values, for females and males. A score of 0 = no effect on studies, 4 = significant / considerable effect on studies. (Mann-Whitney test). The percentage figures in brackets represent the proportion of students who answered the question, relative to the total number of completed questionnaires (Females and males combined).

	Female		Male		Responses n (%)	p value
	Mean (SD)	Median (min, max)	Mean (SD)	Median (min, max)		
Worry about debt	0.92 (1.09)	1.00 (0, 4)	1.25 (1.35)	1.00 (0, 4)	243 (91.7)	0.09
Effect of paid work on studies	1.83 (1.47)	2.00 (0, 4)	1.80 (1.10)	2.00 (0, 4)	59 (22.3)	0.99

Table 89. Students' worry about debt and the effect of paid work on their studies, with corresponding mean (SD) and median (min, max) scores and p values by age band. A score of 0 = no effect on studies, 4 = significant / considerable effect on studies. (Kruskal-Wallis test). The percentage figures in brackets represent the proportion of students who answered the question, relative to the total number of completed questionnaires (age-bands combined).

	Under 20		20 to 24		25 or over		Resp n (%)	p value
	Mean (SD)	Median (min, max)	Mean (SD)	Median (min, max)	Mean (SD)	Median (min, max)		
Worry about debt	0.65 (0.88)	0.00 (0, 4)	1.12 (1.24)	1.00 (0, 4)	1.73 (1.41)	2.00 (0, 4)	243 (91.7)	<0.001
Effect of paid work on studies	1.36 (1.29)	1.00 (0, 4)	1.58 (1.20)	1.00 (0, 4)	2.67 (1.11)	3.00 (1, 4)	59 (22.3)	0.01

Table 90. Different teaching methods, with corresponding mean (SD) and median (min, max) scores and p values for BDS1 and BDS5. A score of 0 = no benefit, 4 = extremely useful. (Mann-Whitney test).

	BDS1		BDS5		p value
	Mean (SD)	Median (min, max)	Mean (SD)	Median (min, max)	
Lectures	2.29 (0.95)	2.00 (0, 4)	2.36 (1.02)	2.00 (0, 4)	0.67
Tutorials	3.33 (0.82)	4.00 (0, 4)	3.33 (0.71)	3.00 (1, 4)	0.67
Chairside	3.42 (0.67)	4.00 (2, 4)	3.78 (0.49)	4.00 (1, 4)	<0.001
Online	2.13 (1.06)	2.00 (0, 4)	1.78 (1.17)	2.00 (0, 4)	0.02
Workshop	2.68 (0.99)	3.00 (0, 4)	2.43 (1.07)	2.50 (0, 4)	0.04

Table 91. Different teaching methods, with corresponding mean (SD) and median (min, max) scores and p values for females and males. A score of 0 = no benefit, 4 = extremely useful. (Mann-Whitney test).

	Female		Male		p value
	Mean (SD)	Median (min, max)	Mean (SD)	Median (min, max)	
Lectures	2.45 (1.01)	3.00 (0, 4)	2.14 (0.92)	2.00 (0, 4)	0.01
Tutorials	3.36 (0.74)	4.00 (0, 4)	3.28 (0.78)	3.00 (1, 4)	0.41
Chairside	3.71 (0.54)	4.00 (1, 4)	3.58 (0.63)	4.00 (2, 4)	0.09
Online	1.96 (1.17)	2.00 (0, 4)	1.87 (1.09)	2.00 (0, 4)	0.61
Workshop	2.58 (1.04)	3.00 (0, 4)	2.47 (1.04)	3.00 (0, 4)	0.46

Table 92. Different teaching methods, with corresponding mean (SD) and median (min, max) scores and p values, by age band. A score of 0 = no benefit, 4 = extremely useful. (Kruskal-Wallis test).

	Under 20		20 to 24		25 or over		p value
	Mean (SD)	Median (min, max)	Mean (SD)	Median (min, max)	Mean (SD)	Median (min, max)	
Lectures	2.25 (0.98)	2.00 (0, 4)	2.35 (0.98)	2.00 (0, 4)	2.43 (1.07)	3.00 (0, 4)	0.52
Tutorials	3.28 (0.85)	3.00 (0, 4)	3.35 (0.73)	3.00 (1, 4)	3.37 (0.69)	3.00 (2, 4)	0.93
Chairside	3.31 (0.71)	3.00 (2, 4)	3.76 (0.51)	4.00 (1, 4)	3.79 (0.41)	4.00 (3, 4)	<0.001
Online	2.06 (1.02)	2.00 (0, 4)	1.93 (1.19)	2.00 (0, 4)	1.62 (1.16)	1.50 (0, 3)	0.22
Workshop	2.60 (1.00)	3.00 (0, 4)	2.51 (1.08)	3.00 (0, 4)	2.55 (0.97)	3.00 (0, 4)	0.80

Table 93. Number and proportion of male and female students who undertook a gap year and the number and proportion that felt a gap year influenced progression through BDS1. (Chi-squared test). The figures in brackets represent the percentage of the total, for each gender, that answered the question.

	Female n (%)	Male n (%)	p value
Gap year undertaken?			0.07
Yes	11 (21.2%)	16 (38.1%)	
No	41 (78.9%)	26 (61.9%)	
Total	52 (100.0%)	42 (100.0%)	
Did gap year influence progression through BDS1?			0.68
Yes	7 (63.6%)	11 (73.3%)	
No	4 (36.4%)	4 (26.7%)	
Total	11 (100.0%)	15 (100.0%)	

Table 94. Transition from school to university. Difficulties perceived by students in changes to teaching style, work complexity, work volume and moving away from home, with corresponding mean (SD) and median (min, max) scores and p values, by gender. A score of 0 = caused no difficulties, 4 = very difficult. (Mann-Whitney test). The percentage figures in brackets represent the proportion of students who answered the question (male and females combined), relative to the total number of completed questionnaires.

	Female		Male		Respondents n (%)	p value
	Mean (SD)	Median (min, max)	Mean (SD)	Median (min, max)		
Change in teaching style	2.08 (1.09)	2.00 (0, 4)	1.90 (1.10)	2.00 (0, 4)	95 (84.1)	0.50
Change in complexity/ difficulty of work	2.26 (1.16)	2.00 (0, 4)	2.36 (0.91)	3.00 (0, 4)	95 (84.1)	0.77
Difference in volume of work	2.67 (1.13)	3.00 (0, 4)	2.52 (0.97)	3.00 (1, 4)	94 (83.2)	0.39
Ease of adapting to move away from parental home	1.63 (1.17)	2.00 (0, 4)	1.44 (0.97)	1.00 (0, 4)	74 (65.5)	0.46

Table 95. Logistic regression analysis of students who undertook a resit of their end of year BDS examination. Male students and those with a degree were the predictor variables.

	OR	p value	95% confidence intervals	
			LCL	UCL
Male	1.36	0.46	0.60	3.07
Have degree	1.07	0.93	0.24	4.76

Table 96. Mean and median Perceived Stress Scale (PSS) scores and p values for gender, BDS year, age band, programme and accommodation type. (p value: a = t-test, b = one-way ANOVA).

	Mean PSS score (SD)	Median (min, max)	p value
Gender:			0.04[a]
Female	18.89 (6.50)	19.0 (4, 39)	
Male	17.00 (7.30)	17.5 (3, 36)	
BDS year:			<0.001[a]
BDS1	15.95 (6.47)	17.0 (3, 31)	
BDS5	19.83 (6.69)	20.0 (4, 39)	
Age:			0.01[b]
Under 20	16.22 (6.34)	17.0 (3, 28)	
20 to 24	18.92 (6.75)	19.0 (4, 39)	
25 or over	19.32 (7.68)	19.0 (6, 36)	
BDS5 on GPEP / 5-year programme:			0.47[a]
5-year	20.01 (6.54)	20.0 (4, 39)	
GPEP	18.86 (7.57)	19.0 (6, 36)	
Accommodation:			0.07[b]
Parental home	18.07 (6.47)	18.5 (3, 32)	
Own	18.92 (8.72)	18.0 (6, 35)	
Student flat/house Share	19.74 (6.51)	20.0 (4, 39)	
University hall of residence	16.46 (6.94)	17.0 (4, 32)	
Other	17.50 (4.66)	16.5 (12, 26)	

Table 97. Mean and median Perceived Stress Scale (PSS) scores and p values for different debt bands, including and excluding tuition fees. (One-way ANOVA).

	Mean (SD)	Median (min, max)	p value
Debt (with tuition fees)			0.13
0	17.57 (6.57)	18.00 (4, 31)	
<£10,000	16.30 (6.75)	17.00 (3, 32)	
£10,000 - £19,999	18.78 (7.52)	18.50 (6, 39)	
£20,000 and over	19.06 (6.48)	19.00 (4, 36)	
Debt (excluding tuition fees)			0.01
0	18.07 (6.44)	18.00 (4, 32)	
<£10,000	16.37 (6.70)	17.00 (3, 32)	
£10,000 - £19,999	20.85 (7.61)	21.00 (6, 39)	
£20,000 and over	19.01 (6.44)	20.00 (4, 32)	

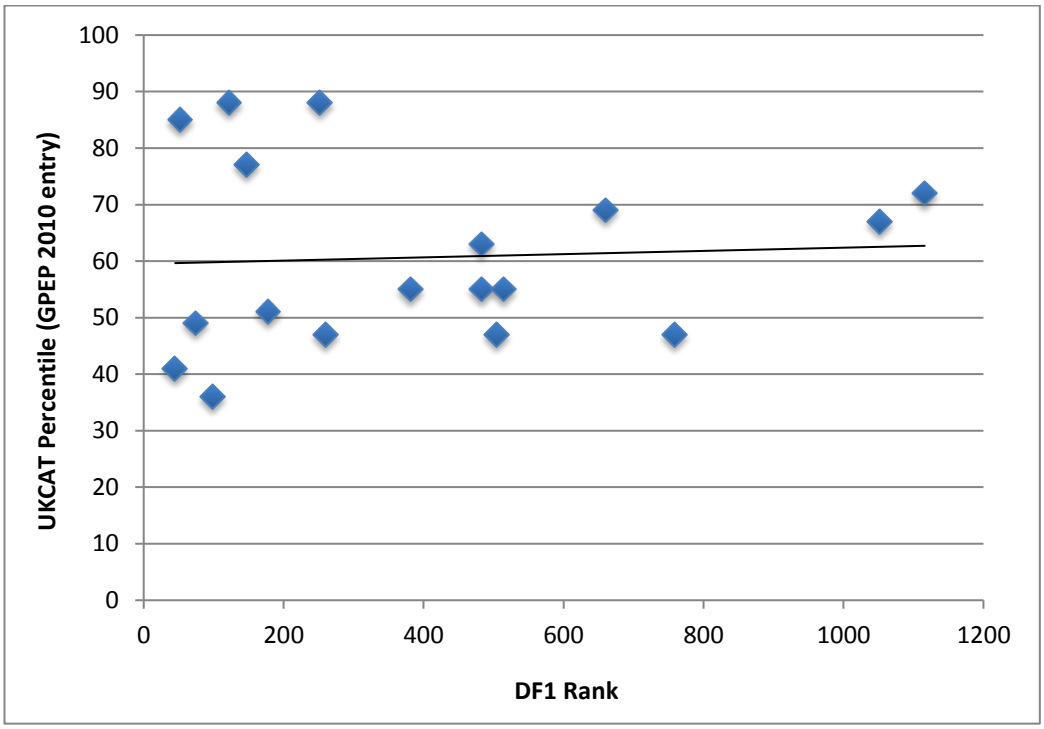


Figure 17. UKCAT percentile vs DF1 ranking for the GPEPs graduating 2014.

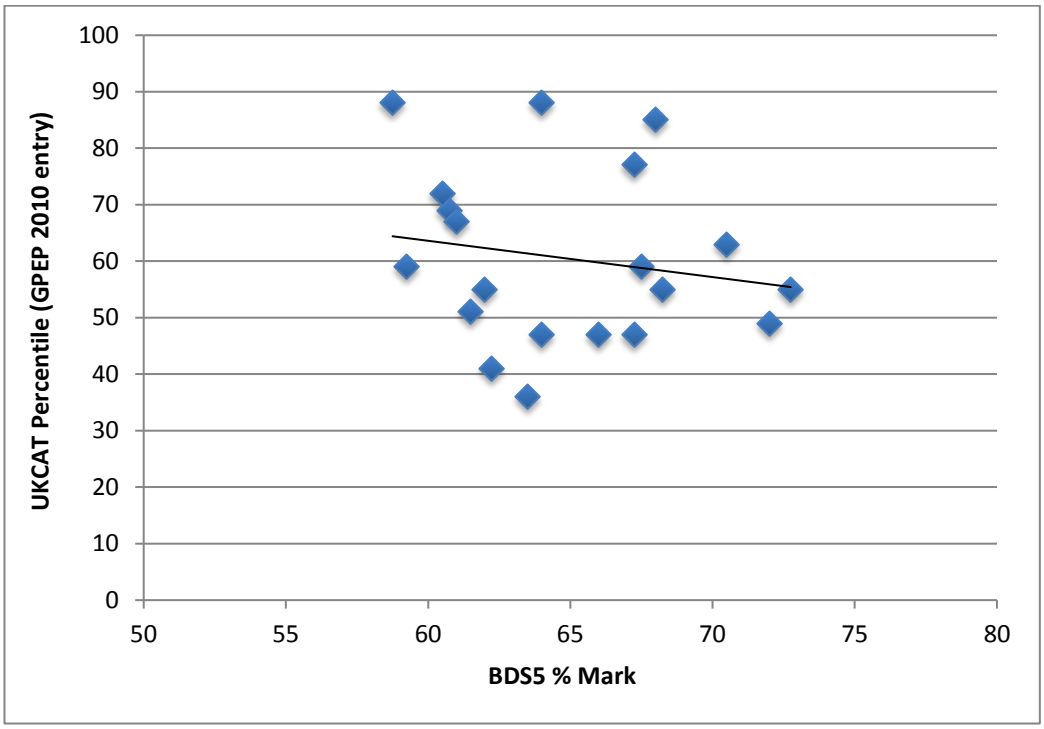


Figure 18. UKCAT percentile vs BDS5 overall (final) score for the GPEPs graduating 2014.

10.4 Focus groups and interviews

10.4.1 Topic guides

BDS1 Focus Group Topic Guide

Initial Question:
"Can you comment on any factors that you are aware of that have affected progression of students through this first year of the course?"

Prompts for further questions:
Positive as well as negative factors
Any ways in which problems could have been lessened by King's?
Difficulties in transition from school learning environment to University one?
Accommodation / Financial / Teaching issues?

(Above to be reviewed and possibly altered following results of questionnaire)

Further possible lines for questioning:
Do you feel that the MMI is a valuable tool in helping to select candidates for Dental School?
Can you think of any ways in which it could be improved?
Did you feel the interview process enabled you to demonstrate your full potential?
- were there any achievements / interests that you would have liked to have had the opportunity to discuss?
Did you feel that you were adequately prepared for the interview process?
- How? School / friends / own research via internet?
Do you feel that MMIs would disadvantage any particular groups of individual?

Did you undertake any preparation for the UKCAT?
- How? School / friends / own research via internet?

BDS5 Focus Group Topic Guide

Initial Question:

"Can you comment on any factors that you are aware of that have affected progression of students through their dental course?"

Prompts for further questions:

Positive as well as negative factors

Any ways in which problems could have been lessened by King's?

Accommodation / Financial / Teaching issues?

(Above to be reviewed and possibly altered following results of questionnaire)

Further possible lines for questioning:

How did you find the VT interview process?

What are your views about nationally ranking students?

Do you feel that the rankings accurately reflect how individuals performed as an undergraduate?

Do you feel that the process is a fair way of allocating VTs to practice?

Can you think of any ways in which it could be improved?

Did you feel the interview process enabled you to demonstrate your full potential?

- Were there any achievements / areas that you would have liked to have had the opportunity to discuss?

Did you feel that you were adequately prepared for the interview process?

- How? Uni / friends / own research via internet?

Do you feel that the VT interview / ranking process would disadvantage any particular groups of individual?

BDS1 One-To-One Interview Topic Guide

How did you find your transition from the school learning environment to the one at University?
Associated lines of questioning: Did you do a gap year (if so any relevance?) has there been much change in quantity of work / teaching styles (if so how did you find this?)

"What factors do you think have affected your progression through this first year of the course?"
Associated lines of questioning: What have your accommodation arrangements been / journey to university (any relevance to progression?)
Any issues surrounding teaching that have been relevant to progression?
Any financial issues affecting progression? (Do any part-time work?)

"What are your views on the dental admission process at King's?"
Associated lines of questioning: Did the process enable you to demonstrate your full potential? (were there any achievements / interests that you would have liked to have had the opportunity to discuss?)
Did you feel that you were adequately prepared for the interview process? (How? School / friends / own research via internet?)
Did you undertake any preparation for the UKCAT? (What?)

"Any ways in which King's could help further with students' progression?"

(Above to be reviewed and possibly altered following results of questionnaire)

BDS5 One-To-One Interview Topic Guide

"What factors do you think have affected your progression through the course?"

Associated lines of questioning: Did you fail any BDS exams? (If so what do you feel were the contributory factors?)
What have your accommodation arrangements been / journey to university (any relevance to progression?)
Any issues surrounding teaching that have been relevant to progression?
Any financial issues affecting progression? (Do any part-time work?)

"What are your views on the VT interview and ranking process?"

Associated lines of questioning: Do you feel that the rankings accurately reflect how individuals performed as an undergraduate?
Do you feel that the process is a fair way of allocating VTs to practice?
Can you think of any ways in which it could be improved?
Did you feel the interview process enabled you to demonstrate your full potential?
- were there any achievements / areas that you would have liked to have had the opportunity to discuss?
Did you feel that you were adequately prepared for the interview process? (How? Uni / friends / own research via internet?)
Do you feel that the VT interview / ranking process would disadvantage any particular groups of individual?

"Any ways in which King's could help further with students' progression?"

(Above to be reviewed and possibly altered following results of questionnaire)

10.4.2 Recruitment e-mail for 2013 focus groups

Subject Box: Study investigating factors that influence progression through the dental course. Volunteers required to participate in a focus group discussion - circular

Circular email for use for recruitment of volunteers for study ref: BDM/11/12-117, approved by BDM RESC (health). This project contributes to the College's role in conducting research, and teaching research methods. You are under no obligation to reply to this email, however if you choose to, participation in this research is voluntary and you may withdraw at anytime.

This study is part of a research project aimed at determining the effectiveness of King's College London Dental School's admissions process at selecting individuals who will develop and progress to become high performing students and dentists. We would like to hear the views of our undergraduate students concerning various related topics.

We are recruiting students from the BDS1 and BDS5 years to participate in some focus group interviews. All students in these years are eligible to apply with the exception of DPMG's (due to the small number of these latter individuals).

Each focus group will comprise of between approximately 4 and 12 students and take place in a private room on the Guy's campus at a mutually convenient time, during March / April 2013 for BDS1 students and April / May 2013 for BDS5 students.

The interviews are expected to last approximately one hour and will be conducted by Dr Jonathan Turner (a Senior Clinical Teacher in the Department of Prosthodontics). You would be involved in one such focus group interview. At the end of the discussion if participants are keen to talk about issues further, a second such session could be arranged – though you would be under no obligation to attend this.

The interviews will take the form of a discussion, between yourself and other students in the group, covering topics such as problems that you feel may affect students' ability to progress effectively through their course. You will not be expected to discuss your own personal situation, but to talk in general terms. Anonymity and confidentiality will be preserved – you will not be named or identifiable in the final transcribed document

Though you may not personally benefit from participating in this research, there is a possibility that the work may lead to recommendations being made regarding the King's undergraduate admissions system, the educational experience of students or the national vocational training selection process. You will also be able to have a copy of the final report upon request.
I do not envisage there to be any risks associated with taking part.

If you would like any further details about this study or to volunteer please contact:
Jonathan Turner (Principal Investigator), Department of Prosthodontics, Floor 25, Guy's Tower Wing, Telephone: 0207 188 7477, e-mail: jonathan.turner@kcl.ac.uk

10.4.3 Information sheet for 2013 focus groups

FOCUS GROUPS

INFORMATION SHEET FOR PARTICIPANTS

REC Reference Number: BDM/11/12 – 117. Approved by BDM Research Ethics Subcommittee

YOU WILL BE GIVEN A COPY OF THIS INFORMATION SHEET

An assessment of the selection procedure and subsequent performance of King's College London dental students against externally defined parameters

We would like to invite you to participate in this original postgraduate research project. You should only participate if you want to; choosing not to take part will not disadvantage you in any way. Before you decide whether you want to take part, it is important for you to understand why the research is being done and what your participation will involve. Please take time to read the following information carefully and discuss it with others if you wish. Ask us if there is anything that is not clear or if you would like more information.

The aim of the research is to determine the effectiveness of King's College London Dental School's admissions process at selecting individuals who will develop and progress to become high performing students and dentists. This study should also provide a picture of how the school's graduates perform at a national level and are viewed by those in charge of vocational training. As part of this research we would like to hear the views of our undergraduate students concerning various related topics.

Though you may not personally benefit from participating in this research, there is a possibility that it may lead to recommendations being made regarding King's undergraduate admissions system, the educational experience of students or the national vocational training selection process. I do not envisage there to be any risks associated with taking part and you will be able to have a copy of the final report upon request.

We are recruiting students from BDS1 and BDS5 to participate in some focus group discussions. All students are eligible to apply with the exception of DPMG students.

The focus group discussions will take place during March / April 2013 for BDS1 students and April / May 2013 for BDS5 students. Each focus group will comprise of between 4 and 12 students and take place in a private room on the Guy's campus. The discussions are expected to last approximately one hour and will be conducted by Dr Jonathan Turner.

The discussions will take the form of a conversation between yourself and other students in the group. You would be involved in one such discussion. At the end of the discussion if participants are keen to talk about issues further, a second such session could be arranged - though you would be under no obligation to attend this. Topics covered will be similar to those covered in the questionnaire, including factors that may have influenced students' performance and progression during the course. The session is designed to find out in more detail your personal views on these subjects.

It is not anticipated you will find the session stressful. All your responses will be considered confidential, however if serious issues arise which are deemed dangerous or likely to impact on your health and safety, which we believe is unlikely, further advice and contact with appropriate KCL authorities, such as counselling services, would be arranged. Similarly if you disclose behaviour which affects patients' care in an adverse manner, appropriate action would have to be taken.

The discussions will be recorded, transcribed by Dr Turner and Dr Cabot and the recordings then deleted. Whilst every effort will be made to ensure anonymity and confidentiality is preserved it is not possible, due to the nature of focus group discussions, to guarantee that these discussions will be kept strictly confidential. You will however not be named or identifiable in the final transcribed document. Prior to deletion, the recordings will be stored in a safe and only be made accessible to Dr Turner and Dr Cabot. Your data will be analysed by the research team but your personal identification will only be known to Dr Turner.

It is up to you to decide whether to take part or not. If you decide to take part you are still free to withdraw at any time and without giving a reason. Due to the interdependent nature of focus groups it will not be possible to remove your ideas and views expressed in the discussion from the study. If you do decide to take part you will be given this information sheet to keep and will be asked to sign a consent form.

If you would like any further details about this study please contact:

Jonathan Turner (Principal Investigator), Department of Prosthodontics, Floor 25, Guy's Tower Wing, Telephone: 0207 188 7477, e-mail: jonathan.turner@kcl.ac.uk

If you decide to take part in the research, you will be covered by King's College London's No Fault Compensation insurance. If this study has harmed you in any way you can contact King's College London using the details below for further advice and information:

Dr L. Cabot, Department of Prosthodontics, Floor 25, Guy's Tower Wing. e-mail: cab.cabot@kcl.ac.uk

10.4.4 Consent form for 2013 focus groups

CONSENT FORM FOR PARTICIPANTS IN RESEARCH STUDIES

FOCUS GROUPS

Please complete this form after you have read the Information Sheet and/or listened to an explanation about the research.

Title of Study: An assessment of the selection procedure and subsequent performance of King's College London dental students against externally defined parameters

King's College Research Ethics Committee Ref: BDM/11/12 – 117. Approved by BDM Research Ethics Subcommittee

Thank you for considering taking part in this research. The person organising the research must explain the project to you before you agree to take part. If you have any questions arising from the Information Sheet or explanation already given to you, please ask the researcher before you decide whether to join in. You will be given a copy of this Consent Form to keep and refer to at any time.

Please tick or initial

- **I understand that if I decide at any time during the research that I no longer wish to participate in this project, I can notify the researchers involved and withdraw from it immediately without giving any reason. I understand however, that due to the interdependent nature of focus groups it will not be possible to remove my ideas and views expressed in the discussion from the study.** ☐
- **I understand that discussions in the focus groups are confidential and that this confidentiality must be maintained by participants.** ☐
- **I consent to the processing of my personal information for the purposes explained to me. I understand that such information will be handled in accordance with the terms of the Data Protection Act 1998.** ☐
- **I consent to my interview being recorded.** ☐

Participant's Statement:

I _____

agree that the research project named above has been explained to me to my satisfaction and I agree to take part in the study. I have read both the notes written above and the Information Sheet about the project, and understand what the research study involves.

Signed **Date**

Investigator's Statement:

I _____

Confirm that I have carefully explained the nature, demands and any foreseeable risks (where applicable) of the proposed research to the participant.

Signed **Date**

10.4.5 Recruitment e-mail for 2013 one-to-one interviews

Subject Box: Study investigating factors that influence progression through the dental course. Volunteers required to participate in an interview - circular

Circular email for use for recruitment of volunteers for study ref: BDM/11/12-117, approved by BDM RESC (health). This project contributes to the College's role in conducting research, and teaching research methods. You are under no obligation to reply to this email, however if you choose to, participation in this research is voluntary and you may withdraw at anytime.

This study is part of a research project aimed at determining the effectiveness of King's College London Dental School's admissions process at selecting individuals who will develop and progress to become high performing students and dentists. We would like to hear the views of our undergraduate students concerning various related topics.

We are recruiting students from the BDS1 and BDS5 years to participate in some one-to-one interviews. All students in these years are eligible to apply with the exception of DPMG's (due to the small number of these latter individuals).

The interview will take place in a private room on the Guy's campus at a mutually convenient time, during May / June2013. It is expected to last approximately 45 minutes and will be conducted by Dr Jonathan Turner (a Senior Clinical Teacher in the Department of Prosthodontics). You would be involved in just one such interview.

The interview will cover topics related to your progression through the course, such as things that you feel helped or hindered your progress. Anonymity and confidentiality will be preserved – you will not be named or identifiable in the final transcribed document

Though you may not personally benefit from participating in this research, there is a possibility that the work may lead to recommendations being made regarding the King's undergraduate admissions system, the educational experience of students or the national vocational training selection process. You will also be able to have a copy of the final report upon request.
I do not envisage there to be any risks associated with taking part.

If you would like any further details about this study or to volunteer please contact:
Jonathan Turner (Principal Investigator), Department of Prosthodontics, Floor 25, Guy's Tower Wing, Telephone: 0207 188 7477, e-mail: jonathan.turner@kcl.ac.uk

10.4.6 Information sheet for 2013 one-to-one interviews

ONE-TO-ONE INTERVIEWS. INFORMATION SHEET FOR PARTICIPANTS

REC Reference Number:BDM/11/12 – 117. Approved by BDM Research Ethics Subcommittee.

YOU WILL BE GIVEN A COPY OF THIS INFORMATION SHEET
An assessment of the selection procedure and subsequent performance of King's College London dental students

We would like to invite you to participate in this original postgraduate research project. You should only participate if you want to; choosing not to take part will not disadvantage you in any way. Before you decide whether you want to take part, it is important for you to understand why the research is being done and what your participation will involve. Please take time to read the following information carefully and discuss it with others if you wish. Ask us if there is anything that is not clear or if you would like more information.

The aim of the research is to determine the effectiveness of King's College London Dental School's admissions process at selecting individuals who will develop and progress to become high performing students and dentists. This study should also provide a picture of how the school's graduates perform at a national level and are viewed by those in charge of vocational training. As part of this research we would like to hear the views of our undergraduate students concerning various related topics.

Though you may not personally benefit from participating in this research, there is a possibility that it may lead to recommendations being made regarding King's undergraduate admissions system, the educational experience of students or the national vocational training selection process. I do not envisage there to be any risks associated with taking part and you will be able to have a copy of the final report upon request.

We are recruiting students from BDS1 and BDS5 to participate in some one-to-one interviews. All students are eligible to apply with the exception of DPMG students.

The interviews will take place during May / June 2013 at a mutually convenient time. The interview will take place in a private room on the Guy's campus, is expected to last approximately 45 minutes and will be conducted by Dr Jonathan Turner. You would be involved in just one such interview, and topics covered will be similar to those covered in the questionnaire and focus groups, including factors that may have influenced your performance and progression during the course. It is not anticipated that you will find the session stressful. All your responses will be considered confidential, however if serious issues arise which are deemed dangerous or likely to impact on your health and safety, which we believe is unlikely, further advice and contact with appropriate KCL authorities such as counselling services, would be arranged. Similarly if you disclose behaviour which affects patients' care in an adverse manner, appropriate action would have to be taken.

The discussions will be recorded, transcribed by Dr Turner and Dr Cabot and the recordings then deleted. Anonymity and confidentiality will be preserved – you will not be named or identifiable in the

final transcribed document. Prior to deletion, the recordings will be stored in a locked safe and only be made accessible to Dr Turner and Dr Cabot. Your data will be analysed by the research team but your personal identification will only be known to Dr Turner.

It is up to you to decide whether to take part or not. If you decide to take part you are still free to withdraw at any time and without giving a reason. In addition to withdrawing yourself from the study, you may also withdraw any data/information you have already provided up until 1 August 2013. If you do decide to take part you will be given this information sheet to keep and will be asked to sign a consent form.

If you would like any further details about this study please contact:
Jonathan Turner (Principal Investigator), Department of Prosthodontics, Floor 25, Guy's Tower Wing, Telephone: 0207 188 7477, e-mail: jonathan.turner@kcl.ac.uk
If you decide to take part in the research, you will be covered by King's College London's No Fault Compensation insurance. If this study has harmed you in any way you can contact King's College London using the details below for further advice and information:
Dr L. Cabot, Department of Prosthodontics, Floor 25, Guy's Tower Wing. e-mail: cab.cabot@kcl.ac.uk

10.4.7 Consent form for 2013 one-to-one interviews

CONSENT FORM FOR PARTICIPANTS IN RESEARCH STUDIES

ONE-TO-ONE INTERVIEWS

Please complete this form after you have read the Information Sheet and/or listened to an explanation about the research.

Title of Study: An assessment of the selection procedure and subsequent performance of King's College London dental students against externally defined parameters

King's College Research Ethics Committee Ref: BDM/11/12 – 117. Approved by BDM Research Ethics Subcommittee

Thank you for considering taking part in this research. The person organising the research must explain the project to you before you agree to take part. If you have any questions arising from the Information Sheet or explanation already given to you, please ask the researcher before you decide whether to join in. You will be given a copy of this Consent Form to keep and refer to at any time.

Please tick or initial

- **I understand that if I decide at any time during the research that I no longer wish to participate in this project, I can notify the researchers involved and withdraw from it immediately without giving any reason. Furthermore, I understand that I will be able to withdraw my data up until 1 August 2013** ☐
- **I consent to the processing of my personal information for the purposes explained to me. I understand that such information will be handled in accordance with the terms of the Data Protection Act 1998.** ☐
- **I consent to my interview being recorded.** ☐

Participant's Statement:

I _____

agree that the research project named above has been explained to me to my satisfaction and I agree to take part in the study. I have read both the notes written above and the Information Sheet about the project, and understand what the research study involves.

Signed **Date**

Investigator's Statement:

I _____

Confirm that I have carefully explained the nature, demands and any foreseeable risks (where applicable) of the proposed research to the participant.

Signed **Date**

10.4.8 NVivo screenshots

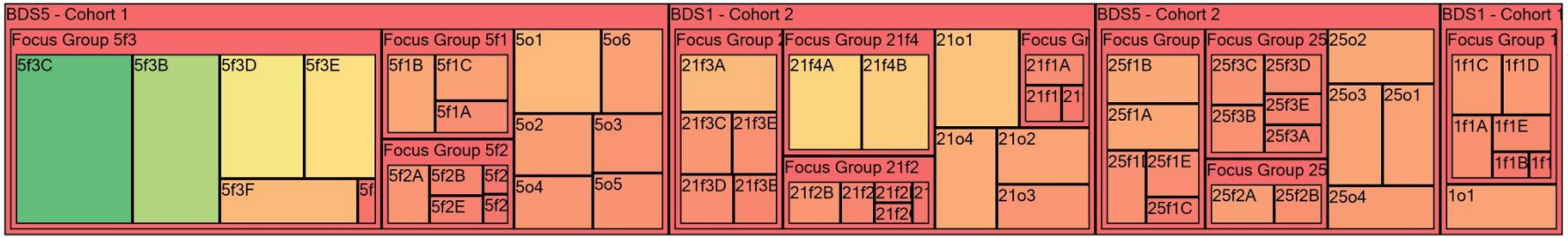


Figure 19: Relative contributions made by each focus group and interview participant.

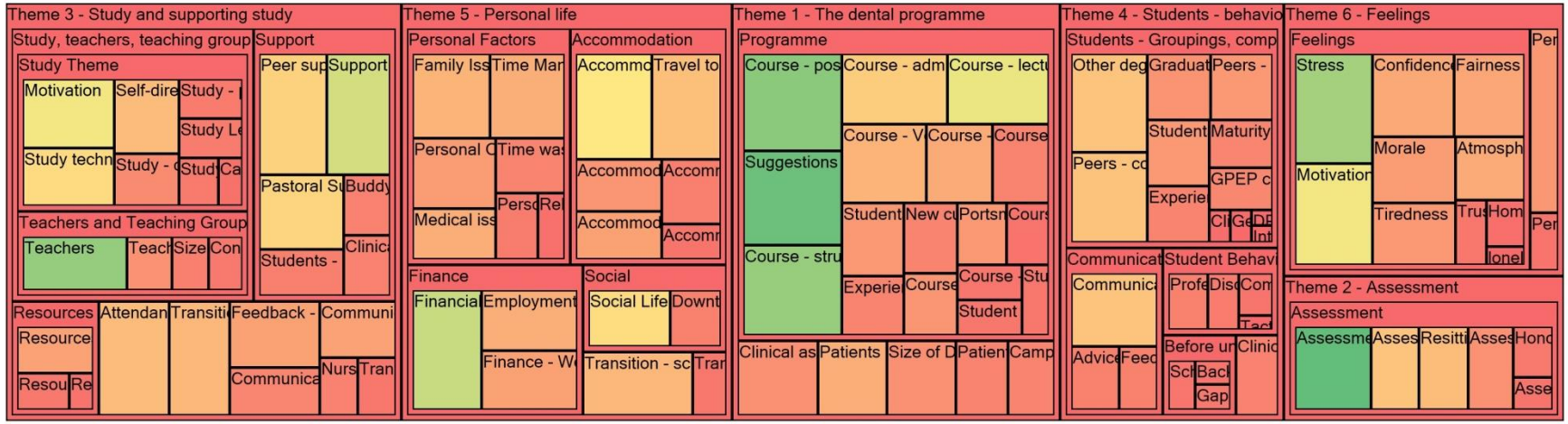


Figure 20: Relative proportions of each code within the six themes.